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Foundation Update Winter 2013

Trailblazing Aging Research: Old Grey Muzzle Tour 2013



Day 1 Homer, Alaska
Kyrie
118 human years

“Driven by the idea that there’s no substitute for first-hand observations, we’re taking aging research out of the laboratory and into the living room – studying the oldest-living dogs in their homes to collect clues to highly successful aging and cancer resistance in people and pets.”

David J. Waters, Director, Center for Exceptional Longevity Studies



Day 6 Claremont, NH
Bill
111 human years



Day 40 W. Lafayette, IN
TEDx Talk
“The Oldest Dogs
as Our Greatest Teachers”



March 4 – April 12, 2013

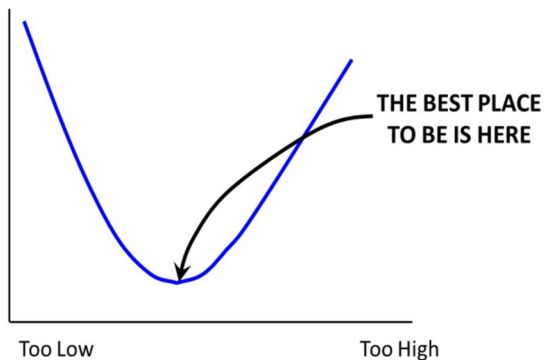
This year witnessed **Old Grey Muzzle Tour 2013**, a 40-day cross-country scientific expedition by Dr. Waters to advance the research uncovering the secrets of highly successful aging and cancer avoidance. Studying the oldest-living dogs in their homes – taking research out of the laboratory and into the living room – is a whole new way of doing aging research. Embracing the theme of **“To Discover, To Educate”**, Dr. Waters made **12 scientific stops** to study the exceptional dogs and **9 celebration stops** along the way. At each celebration stop, Dr. Waters led an evening of discussion with the goal of recognizing and educating groups who extended their support for this important research. The Murphy Foundation’s **Center for Exceptional Longevity Studies** is home to the **Exceptional Longevity Data Base**, the first systematic study of extreme longevity in pet dogs. By building the **Murphy Foundation’s Aging Biorepository** – the world’s first collection of annotated specimens of DNA, serum, blood cells, and tissues collected from the longest-living dogs – we are creating a national resource that will enable scientists to take their best shot at uncovering clues to what it takes to age more successfully and avoid cancer. For more details about Old Grey Muzzle Tour 2013, go to our website at www.gpmcf.org/MuzzleTour.html. From Alaska to New Hampshire, you can find **photos and stories from Dr. Waters’ 40-day journey** on our Facebook page: www.facebook.com/TheOldGreyMuzzleTour.

Inside This Issue

Being a researcher is a lot like being a detective – always looking for clues. The best detectives know just where to find the most reliable clues. What about researchers? Are they skilled at looking, at digging through the mountain of potential clues, breaking us free from the tyranny of old ideas? **Albert Einstein** summed up the research method: “If we knew what it was we were doing, it wouldn’t be called research.” In this issue of *Foundation Update*, we offer an inside look at our process of searching and re-searching – our detective work. We share our progress in gathering and disseminating the clues we are finding in the areas of aging and cancer. We invite you to sit back and savor our detective stories.

Updates

Your Selenium Intake, Your Prostate, and “U” – In 2012, *Foundation Update* featured the compelling scientific evidence supporting the Murphy Foundation’s stance on selenium and your health. Selenium is a cancer-fighting nutrient, a “good thing”. But what we are learning is that more of a good thing is not always better. **We call this U-shaped thinking.** It means that to lower



your prostate cancer risk you want your selenium levels in mid-range status – in the trough of the U – not too low, not too high. A simple clip of your toenails is the first step in securing all the information you need to achieve this health-promoting navigation. Using a toenail test developed by Murphy scientists, the **SeleniumHealth™ Team at the Murphy Foundation** has been helping men measure and adjust their selenium levels. The **SeleniumHealth™ toenail test** takes away the guesswork, eliminating the dire effects of unnecessary oversupplementation. New research from Murphy scientists published this spring in the scientific

journal *Biofactors* and featured by **UroToday** provides mechanistic clues that further strengthen the U-shaped thinking. In November 2013, UroToday, a global leader in the delivery of timely medical news that is relevant to the practice of urology, featured our new research study on their site, **UroToday.com**. The site attracts an audience of more than 60,000 international medical professionals every month. You can download or read the 2-page commentary written by Dr. Waters that was published on UroToday.com by going to our website at www.gpmcf.org/PDFs/UroToday.pdf.

Women, Selenium, and Optimal Health: An Evolution in Thinking – Now a growing body of evidence is suggesting that **measuring and adjusting selenium to optimal levels can benefit women**. At our website, scientists at the Murphy Foundation have gathered key information from scientific reports linking selenium, women’s health, and the U-shaped thinking. A news story released on the national press wire from the **Purdue Research Park** titled “**Research Sheds Light on How Selenium Fights Cancer, Improves Health**” is also available at our website: www.gpmcf.org/selenium_women.html. Take home message: To optimize health, both men *and* women should get their selenium level right.

Murphy Scientists Engage in the Art of Disentangling Thinking – Four years ago, Murphy scientists published a study in *Aging Cell* that challenged the conventional way of thinking about ovaries. **Not just reproductive units, ovaries are endocrine organs.** And when we remove endocrine organs – in dogs, in women – we can expect to re-set the system, impact overall health. A cutting-edge discovery like this one demands cutting-edge education. With this goal in mind, the Murphy Foundation is helping veterinary health professionals and pet owners understand the new thinking: *Keeping ovaries longer can lead to longer lives*. This year, “**Caught in an Act of Convenience: Disentangling Our Thinking About the Influence of Ovariohysterectomy on Healthy Longevity in Pet Dogs**”, an essay co-authored by Dr. Waters and **Emily C. Chiang, PhD** was published in a new book, *Dogs: Domestication History, Behavior, and Common Health Problems*. The essay, which puts into plain language how we might direct our re-thinking and shift the dialogue to illuminate the longevity benefits of ovaries, is available at our website: www.gpmcf.org/PDFs/Action.pdf.

Shorts

International Congress Showcases Murphy Foundation's Science on Successful Aging – In June 2013, Murphy scientists travelled to Seoul, South Korea to deliver two scientific papers at the **20th IAGG World Congress of Gerontology and Geriatrics**.



A gathering of more than 3500 scientists and health professionals, the world congress marked a milestone in gerontology research and education.

For the first time, a scientific symposium that explored clues to exceptional longevity featured research findings from 100 year-old people (centenarians) and the oldest-living Rottweilers studied by Murphy Foundation scientists.

Researchers discussed for the first time **studies of human centenarians and centenarian dogs side-by-side** – the lines between the two species blurred in this academic forum. This aligns with a vision held by Murphy scientists at the Center for Exceptional Longevity Studies: We will continue to capitalize on this powerful opportunity of harnessing pet dogs to become biogerontology's new workhorse, because the approach holds great promise for helping people and pets achieve highly successful aging.

Fostering Self-Renewal: Gateway to Research Excellence – If our goals are to beat cancer, to slow down the rate of aging, must we wait for new technologies to save the day?

Or could we reach these strenuous goals by simply boosting the performance of the researchers and health professionals who have already joined the fight? The Murphy Foundation began to pursue this line of reasoning in 2012 when Dr. Waters delivered a keynote address at an international symposium on research and education. The line of thinking articulated in that keynote is now captured in two new publications: **“Fostering the Self-Renewal of Teachers: An Underutilized Approach to Innovating Interdisciplinary Education”** published in the *Journal of Systemics, Cybernetics and Informatics*, and **“The Paradox of Tethering: Key to Unleashing Creative Excellence in a Research-Education Space”** published in *Informing Science*. Both papers are available to download or read at the Murphy Foundation website: www.gpmcf.org/PDFs/FosteringSelfrenewal.pdf and www.gpmcf.org/PDFs/InformingScience.pdf. The Murphy Foundation sees the biology of aging, the science of cancer prevention, and the attitudes and skills that promote peak performance as 3 areas of inquiry that can deliver our ultimate goal: **developing an effective, more holistic approach to achieving highly successful aging**.

Thinking Several Moves Ahead: Exploiting the Evolutionary Dynamics

of Cancer – Tumors become life-threatening because they evolve into populations of cells with lethal characteristics. Just how rapidly this lethal evolution takes place is determined by how effectively tumor cells exploit their local environment. This raises the possibility that we might manipulate the destiny of a particular cancer by paying closer attention



to cell-to-cell competition within the cancer ecosystem. In June 2013, Dr. Waters was one of 200 scientists who attended the **2nd International Biannual Evolution and Cancer Conference at University of California, San Francisco**. The conference tackled the thought provoking question: Can taking an evolutionary perspective help us develop a more useful conceptual framework so we can defeat cancer? As cancer scientists and oncologists, we need to get smarter about the evolutionary dynamics of each cancer – the complex competitions occurring between the cancer cells inside a patient's tumor. Progress in this direction could create a new array of dynamic anti-cancer strategies **focused less on trying to eradicate every tumor cell, focused more on a balancing act** – establishing a patient-tumor cell balance along with tumor cell-to-tumor cell balance – that would halt progressive tumor growth. The hopeful result: **Cancer would no longer threaten lives**. Tumors would be part of our ecology – no different from the bacteria that inhabit our gut or the furniture that fill our living rooms. Stay tuned for progress in this area as we strive to think several moves ahead.

Exploring Trade-Offs: Does Reproduction Carry a Longevity Cost? –

Some scientists study liver disease, others study the brain. In this age of specialization, we need more scientists to focus their attention on the whole health process, not just their favorite organ or disease. We place great value in **whole organism thinking** because it can provide essential clues to important **trade-offs that impact health**. It is difficult to believe that focusing on your brain and forgetting your liver would lead to progress that is memorable. A scientific paper published by Murphy scientists this year illustrates their attention to one such trade-off: **the potential trade-off between investment in reproduction and longevity**. Previous work in this area has produced mixed results – in some cases women who had offspring had their longevity cut short compared to women who did not have children. Our research, which looked for clues in exceptionally long-lived female Rottweilers, suggests that neither number of offspring, nor age of mother at first or last reproduction was associated with diminished longevity. Instead, independent of reproduction, **longer duration of ovary exposure was associated with highly successful aging**. And consistent with some studies in women, our data showed an inverted U-shaped trend – a moderate investment in reproduction (not too many, not too few offspring) may actually *promote* longevity. **More U-shaped thinking!** The manuscript, published in the scientific journal **AGE**, is available at our website: www.gpmcf.org/PDFs/AGE.pdf.

Geroscience: A New Direction in Aging Research – Should scientists focus their efforts on better understanding the process of aging or concentrate more on specific age-related diseases, such as



cancer, diabetes, or Alzheimer's disease? In the past, these domains of inquiry have been kept apart. Could this dichotomy be standing in the way of research progress? In November 2013, **Dr. Waters joined a group of 500 scientists at an aging summit at the National Institutes of Health (NIH) in Bethesda, MD.** The conference titled "**Advances in**

Geroscience: Impact on Healthspan and Chronic Disease" concluded that the public would be better served if scientists shifted more

of their attention to understanding the process of healthy aging. "Curing one disease at a time is no longer such a good idea," said **Dr. Francis Collins, Director of the NIH**. The Murphy Foundation is proud to have participated in this landmark scientific meeting – the first ever conference on *geroscience*, the term developed to encompass scientific inquiry that explores the vital link between the aging process and the advent of chronic age-related diseases. Expect to hear more in the future about *geroscience*, a re-naming and conceptual re-framing that brings fresh momentum to accelerating research progress.

In Celebration, In Memorium – In 2013, **Marjorie Hays, R.N.**, a member of the Murphy Foundation's Board of Directors, received the Lifetime Award for Distinguished Service from the **Indiana Public Health Association**. The award recognizes Ms. Hays' half-century of constructive activism in promoting grassroots progress in the areas of mental health, cancer prevention, and healthy life-styles. This year also marked the passing of a special person with close ties to the Foundation. **Paul Shumate** of Barrington, IL was an enthusiastic supporter of the Murphy Foundation's trailblazing research, particularly the efforts to develop new cancer-fighting technologies. Together with his wife Helen, Mr. Shumate supported the Murphy Foundation's work treating canine cancer patients by implanting bead-encapsulated living mouse cancer cells, an approach featured in **The Wall Street Journal** in 2011.

Kudos

Innovative Thinking Recognized: Dr. Waters' TEDx Talk – On day 40 of the Old Grey Muzzle Tour, Dr. Waters was honored to deliver a TEDx talk to an audience of over 1000 at Purdue



University's Loeb Playhouse. **TED aims to provide a platform for the world's smartest thinkers, greatest visionaries, and most-inspiring teachers**, so that millions of people can gain a better understanding of the biggest issues facing the world. Core to this goal is a belief that there is no greater force for changing the

world than a powerful idea. Dr. Waters' inspirational talk **“The Oldest Dogs as Our Greatest Teachers: Get the Words Out of Your Eyes”** at the TEDxPurdueU event exemplified the creative excellence that is the allure of a TED experience. Watch the 12 minute video at our website: www.gpmcf.org.



Research sheds light on how selenium fights cancer, improves health

Published: November 21, 2013

WEST LAFAYETTE, Ind. - Personalizing nutrition for disease prevention is one of the major challenges facing scientists and health professionals. Emerging data on the relationship between the intake of selenium, which is an essential trace mineral, and human health suggests that more selenium is not necessarily better.

A study conducted by scientists at the [Gerald P. Murphy Cancer Foundation](#) sheds new light on the anticancer action of selenium in the aging process, which aligns with U-shaped thinking. This thinking suggests being in the middle range of selenium intake is better than being too high or too low. The study has been published in the peer-reviewed scientific journal BioFactors and featured by UroToday.

The Gerald P. Murphy Cancer Foundation is a not-for-profit research institute focused on cancer and aging. It is based at the [Purdue Research Park](#) of West Lafayette.

Investigators used controlled laboratory experiments to show that selenium can trigger the elimination of prostate cells that have the most genetic damage. The results of these laboratory studies rested upon the researchers' ability to develop a model system in which the level of genetic damage could be controlled in both human and canine cells. Emily C. Chiang, Ph.D., research associate at the Murphy Cancer Foundation and the lead author of the research, said the work introduces an important perspective on the anticancer action of selenium that is independent of its role as an antioxidant.

"By documenting the ability of selenium to sweep away DNA-damaged cells, a process we have termed 'homeostatic housecleaning,' the new study builds upon previous observations that the anticancer benefit of selenium supplementation in humans and animals cannot be explained solely by the ability of this nutrient to shield tissues from oxidative stress," Chiang said.

David J. Waters, Ph.D., DVM, director of the Murphy Cancer Foundation's Center for Exceptional Longevity Studies, wrote the commentary "Your Selenium Intake, Your Prostate, and 'U,'" which was published on UroToday.com as a featured "Beyond the Abstract." The commentary describes the research in the context of U-shaped thinking about selenium and healthy aging, in particular reducing a man's risk of getting prostate cancer. "When it comes to identifying the optimal selenium dose for prostate cancer risk reduction, it is unlikely that more selenium will always be better," he wrote. "Landing in the trough of the U, achieving mid-range selenium status, is more desirable than being too low or too high."

This middle-of-the-road-is-better stance is bolstered by the extensive review of the scientific literature by professor Margaret Rayman of the University of Surrey, U.K., who concluded in the journal *The Lancet*: "The crucial factor that needs to be emphasized with regard to the health effects of selenium is the inextricable U-shaped link with status; whereas additional selenium intake may benefit people with low status, those with adequate-to-high status might be affected adversely and should not take selenium supplements."

"The possibility that the trough of the curve is precisely where the homeostatic housecleaning effect of selenium is maximized offers a new, working explanation for why more selenium is not always better," Waters said. "We believe selenium is instrumental in optimizing how the body responds to cellular damage, which can translate into improved health and disease resistance."

As the researchers work to hammer out the specific links between selenium and prostate cancer, men are looking to optimize their selenium intake for disease prevention.

Measuring selenium status and then adjusting selenium levels to mid-range status offers men a practical and informed approach, rather than blindly taking selenium supplements and risking the downside of oversupplementation, Waters said. Harnessing this U-shaped thinking, health professionals at the Murphy Cancer Foundation are utilizing SeleniumHealth™ - a commercially available toenail test developed by the Murphy Foundation in collaboration with Bostwick Laboratories LLC - to assist men who are motivated to target their selenium intake to achieve optimal health.

Waters points to the test as a simple, straightforward method that eliminates the guesswork about a person's selenium level. He said a toenail clipping provides a reliable picture of how much selenium people have been getting from their diet and supplements over the previous three months. He added that women's health also could be impacted by selenium.

"Most experts agree that the evidence for an association between selenium and cancer risk in women is not as strong as it is for prostate cancer. But a growing body of evidence suggests that measuring and adjusting the intake of selenium to optimal levels so that it is not too low or too high can benefit women's health in several other ways," said Waters, who serves as associate director of Purdue's Center on Aging and the Life Course. "Women with lower selenium levels have been reported to be at increased risk for cardiovascular disease and cognitive decline. Women with selenium in mid-range status may enjoy improved hip bone density, whereas selenium levels exceeding the mid-range were associated with a six-fold increased risk of type II diabetes in a nationwide study of U.S. women."

Information on scientific reports linking selenium, women's health and U-shaped thinking can be found at <http://www.seleniumhealthtest.com>.

About the Gerald P. Murphy Cancer Foundation

The [Gerald P. Murphy Cancer Foundation](#) seeks to identify important genetic and life-style determinants of cancer resistance and to better understand the complex relationship between aging and cancer. The research is conducted jointly by the Murphy Cancer Foundation and Purdue University. The Murphy Foundation is a 501(c)(3) not-for-profit research institute.

About Purdue Research Park

The [Purdue Research Park](#), with four locations across Indiana, has the largest university-affiliated business incubation complex in the country. The park network is home to about 240 companies that employ about 4,500 people and are located in West Lafayette, Indianapolis, Merrillville and New Albany.

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Gerald P. Murphy Cancer Foundation

INNOVATIVE RESEARCH FOR PERSONALIZED CANCER PREVENTION

Dear Friends,

December 2013

13 really is a lucky number! This year marks 13 years that the Murphy Foundation has been advancing under my leadership. Over this time, many of you have witnessed the scope of our accomplishments: moving our basic research on selenium and cancer prevention into developing the **SeleniumHealth™ toenail test** that men and women are using to get their selenium level right; telling the world in *Scientific American* about the unique opportunities to gather **Cancer Clues from Pet Dogs** that will help both people and pets; developing a **Personalized Cancer Prevention Program** that is cross-training the next generation of researchers in cancer, aging, and communicating health research to the public; and, this year, my cross-country trek **The Old Grey Muzzle Tour 2013** putting the Murphy Foundation on the map as leaders of a whole new way of thinking about how aging research is done. We're making our own luck – studying cancer-resistant 13 year-old Rottweilers that are equivalent to 100 year-old people to discover clues to successful aging and cancer avoidance. And as we look to the horizon, **our process of discovering and educating shows no signs of slowing down.**

Your unwavering faith in Murphy Foundation scientists to perform at the highest possible level inspires us. Each year at this time, my team and I appraise our accomplishments by asking the question framed by the famed philosopher and father of modern psychology William James: **“Does the world, with our additions, rise or fall in value?”** It is these high expectations that stretch our imaginations and motivate us to succeed.

This issue of **Foundation Update** highlights the considerable progress that we have made in 2013. This body of work is the product of smart investment in specific areas of research and education that hold great promise. While grants and contracts fund the majority of our work, **our needs cannot be met without the individual gifts that you make to support us.** You make our ideas come to life. *You enable us to discover, to educate.* With each dollar that you generously invest in the Murphy Foundation, we move ahead – ever closer to the goal of living the longest and healthiest that we can. To each of you, let me say how grateful we are to serve you in this pursuit.

Best Holiday Wishes,
David J. Waters, DVM, PhD

Please detach and return in the envelope enclosed, with checks payable to “GPMCF”

Please accept my enclosed tax-deductible gift in support of the Murphy Cancer Foundation:

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- Please apply my enclosed donation to Path-to-Progress™, your cancer research with and for pet dogs.
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