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CRYONICS

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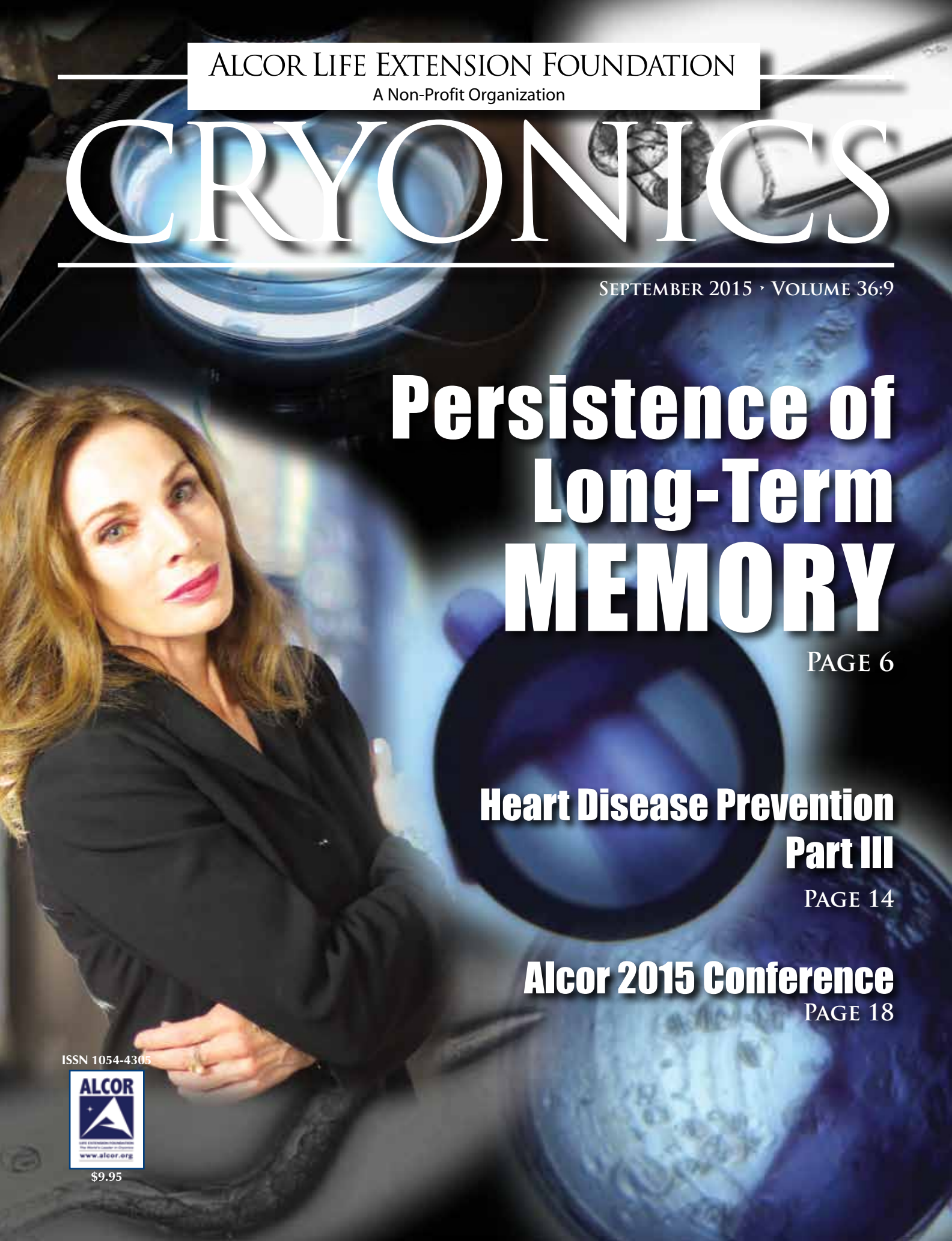

Persistence of Long-Term MEMORY

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Heart Disease Prevention Part III

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Alcor 2015 Conference

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CRYONICS

On the cover: *Natasha Vita-More*
Photo credit: Steve Graber

COVER STORY: PAGE 6

Persistence of Long-Term Memory in Vitrified and Revived Simple Animals
With support from the Alcor Life Extension Foundation, Dr. Natasha Vita-More designed and conducted an elegant study to investigate long-term memory survival after vitrification in *C. elegans*. In this informative account Natasha tells us about the origins of her study, the design of the study, her collaborators, the exciting, positive results, the public reception of the research, and future research directions.

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QUOD INCEPIMUS CONFICIEMUS

Photo: Cryo-Care Equipment Corporation at 2340 E. Washington St., Phoenix, AZ. Dr. Bedford's "home" in 1970 or 1971.

CRYOFIXATION AND CHEMOPRESERVATION By Aschwin de Wolf

The most common modern protocol for imaging brain structure at high magnification is to chemically fix the brain with aldehydes (formaldehyde, glutaraldehyde) and heavy metals like osmium and then prepare it for electron microscopy imaging. Using this method, a tremendous amount of detailed anatomical information about the structure of the brain in its healthy and pathological state has been obtained, including the effects of (prolonged) ischemia.

Almost from its inception, however, the limitations of this method have been recognized. In particular, when fixatives are introduced to the brain through the process of perfusion a number of distinct artifacts are produced, notably shrinking of the brain and a reduction of the extracellular space. While different solutions and protocols have been developed to reduce these artifacts, the gold standard for ultrastructural analysis is a method that does not use aldehydes at all; cryofixation.

In cryofixation small tissue samples are rapidly cooled (without freezing) and then prepared for electron microscopy. This method produces the most realistic images of the ultrastructure of the brain, as evidenced by papers that compared this method with aldehyde fixation or used advanced tools to understand the properties of the brain without doing electron microscopy.

Although the word "vitrification" is rarely used in the context of cryofixation, the pristine images in this method can only be achieved when ice formation is avoided through ultra-rapid cooling. Vitrification without the use of high concentrations of (toxic) cryoprotectants would be quite attractive if it could be scaled to the size of organs (or even humans!) but unfortunately this method can only be used on very small tissue samples.

The pristine images obtained from cryofixation raise some important issues. Does conventional aldehyde fixation produce only predictable distortions or is identity-specific information irreversibly lost? What are the ultrstructural effects of the heavy metal exposure when cryofixed samples are prepared for electron microscopy? In a more general sense, to what degree can we be confident that a technology can produce a completely realistic image of the ultrastructure of the brain? Will computer simulations of scanned fixed brains need extensive correction if they are to serve as a simulation of the brain?

One clear advantage of using viability assays in addition to electron microscopy is that we can test brain slices or whole brains for resumption of function (or retention of memory) after subjecting them to experimental protocols. This is a clear advantage of the use of cryopreservation technologies over chemical fixation. In a cryonics case we can monitor the patient from the start of our procedures to the point of long term care and collect data and viability information. In the case of chemopreservation no such feedback is possible and taking brain biopsies for electron microscopy is all we can do to assess the effects of our cryopreservation procedures.

It is tempting for a cryonics organization to choose the method of preservation that produces the most crisp electron micrographs. In reality, however, there are challenges and unknown issues. Cryofixation cannot be scaled to work for cryonics. What is the effect of conventional aldehyde perfusion in ischemic brains? How do aldehyde fixed brains look on the molecular level compared to cryopreserved brains? How can we know that identity-critical information is not irreversibly altered? And, last but not least, any preservation technology that renders tissue dead by conventional criteria cannot be considered as a means for achieving real suspended animation. ■

Persistence of Long-Term Memory in Vitrified and Revived Simple Animals

By Natasha Vita-More, Ph.D.

"If the aging process is controlled in a similar way in worms and humans, then we can use what we learn about worms to speed our study of higher organisms." — Cynthia Kenyon

Demonstrating the preservation of memory after cryopreservation is a crucial step for cryonics. The research leading to this breakthrough will help to build momentum toward more advanced studies on information storage within the brain, as well as short-term behaviors of episodic, semantic, procedural, and working memory.

In this article, I will review how I became involved in this research, the guidance along the way, my initial training at 21st Century Medicine, pitching the research project to Alcor, and submitting my proposal to its Research Center (ARC). I will then take you into the lab, the process of trial and error in our first studies, developing a protocol based on olfactory imprinting and applying several cryopreservation methods, developing the migration index, and the rewards of working with a lab technician who became an admired colleague.

From this experience and looking toward the future, I am more committed than ever to support and help lead scientific research projects that enrich learning about memory after cryopreservation. But this does not come without the insight to imagine, to speculate, and to hypothesize. Observing a gap in the current state of things triggers a desire to understand why there is a gap and to do something about it. From there we can query until one idea sticks and garners enough value to move forward. For me, this one idea was all about memory retention.

The lingering concern: 'How can something that cannot be demonstrated be scientific?' found in the Alcor FAQ has now been addressed. There is some existing evidence of preservation of neural structures as demonstrated by electron microscope studies. Yet these studies observe static structures and not survival of memory in practice. While the larger question of how a person's identity can be sustained after cryonics has not been conclusively answered, it is a fact that long-term memory is retained in a simple animal. This experience causes me to think back on Neil Armstrong's statement after the Apollo 11 Mission. Certainly not as grand, but nevertheless, "This is one small step for a [nematode], but one giant leap for [cryonics]."

DEVELOPING THE RESEARCH PROJECT

This research was to put into motion as a project I had been musing about for many years that concerns the outstanding issue of cryonics and memory retention. While the science and technology of cryopreservation have advanced over the past decades, there had been no direct evidence that an animal could be cryopreserved, revived, and tested for memory retention with positive results. During the 25 years I have been a member of Alcor, I have listened to the internal conversations among cryonicists and read public commentary about the viability of cryonics. A core question has been: Will you remember who you are if and when you are revived? While this question can only be answered definitively once the first cryopreserved person is revived, it seemed logical that there needed to be small, baby steps along the way. Several people had begun projects to explore this area, but none had been conclusive, let alone published.

As a bit of background, some of my colleagues in the field in which I pursued by doctorate had done interesting biodesign experiments. Dr. Edwardo Kac had developed the transgenic "GFP Bunny," Stelarc succeeded in cloning and transplanting his ear onto his arm, and Dr. Ionat Zurr with Oron Catts had developed tissue culture as "semi-living" sculptures. Yet, there was an identifiable lack of exploration and experiments in the biodesign field of human enhancement and life extension that linked directly to cryonics.

Dr. Greg Fahy, a leading cryobiologist, had been an exceptional mentor since the inception of this project. He had told me about a researcher's work that captured stunning visuals of human sperm as they absorbed glycerol and were obscured by ice formations, until the ice receded and they began moving again. Inspired by this,

I set out to study what types of life forms I could work with and which exhibited unique physical movement. Based on Greg's advice, I decided to work with *C. elegans*.

> *"Caenorhabditis elegans* is one of the most important models used in biology and neurology and has countless applications in the area of biological sciences. The simplicity of its size (1mm), the transparency of its neuronal network (hermaphrodites contain 302 neurons), and its short but complex life cycle make *C. elegans* of potential value to studies of memory retention after cryopreservation." (Vita-More & Barranco, 2014).

C. elegans can be trained through nonassociative learning, associative learning, and imprinting. They can habituate to chemical stimuli and learn smells, tastes, temperatures and oxygen levels. They also respond to vibrations, such as tapping on the petri dish. In regards to cryonics, *C. elegans* have high survival rates, with little to no cryoprotectant, when using ultra-rapid cooling and warming methods. By providing a case where I could use a viable learning environment for the worms, cryopreserve them with their structure intact, revive them, and then test their memory of the learning behavior, I might be able to add significant research to the field of cryonics. I spent the next year or so looking for grant money to support the research. Eventually persistence paid off, and Fahy was consequential in my obtaining the grant from Alcor Life Extension Foundation.

> "Memory models that are amenable to testing after cryopreservation are not plentiful. The best test of memory is behavioral, but there are no easily accessible organisms more complicated than *C. elegans* that can be cryopreserved whole to enable behavioral tests after rewarming. So I think Natasha's proposal is appropriate for pushing the envelope given the constraints involved. Perhaps success in this project could serve as a jumping off point to testing polar insects or Siberian salamanders down the line, but first things first. You have to walk before you can fly." (Fahy, 2013)

The question I asked in this research was whether memory could be retained after cryopreservation.

The question I asked in this research was whether memory could be retained after cryopreservation. This single question became the object of the research. To attempt to answer this question, the *C. elegans* was the model organism for testing. It is a known model used in biology and neurology, with the simplicity of its small size, and it had already been successfully vitrified and (separately) trained. But there had been no research experiments combining both vitrification and cryopreservation, and also training and testing memory after reviving. In short, it was the only simple animal where cryopreservation and revival had been demonstrated and a well-defined assay of learning had been completed.

Starting with the completed research performed in these two areas, my team sought to build upon these experiments in our study titled "Persistence of long-Term Memory in Vitrified and Revived *C. elegans*."

SETTING UP THE LAB AT ALCOR

After receiving the grant to begin the research, the Alcor team worked with me to locate a work area with space for a hood, and then I started ordering supplies. Biochemist Hugh Hixon advised me about basic chemistry and we selected an aluminum mini-Dewar for holding the liquid nitrogen for the vitrification studies. We prototyped several methods for detecting worm migration on slides and petri dishes. Technology innovator Steve Graber created the lab area, set up the hood, and worked with me to test microscopes for depth of field, lens magnification, and our video recording of the studies. Dr. Mike Perry worked with me to brainstorm statistical software for analyzing the migration rates of tested worms.

Fahy had introduced me to Dr. Ramon Risco, founder of the CryoBio Tech Research Group. He provided the protocol for a particular method of vitrification, known as the slush method. This method uses quartz capillary tubes that have a specific diameter and require a slush making apparatus. Hugh ran with this idea and built our slush system.

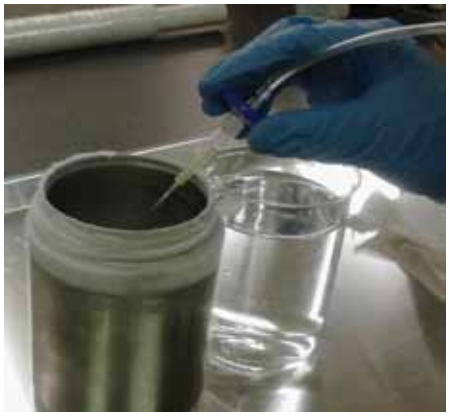
New lab hood.

Natasha's Mind Map of Tasks.

Steve, Hugh and Mike testing Hugh's slush system.

We were excited to be moving forward with the research and making some progress; nevertheless, one core issue was that I needed another researcher and a highly skilled lab technician to work directly with me in the lab on a day-to-day basis. I contacted Chris Rasch, who had worked with cryopreservation of organs and had knowledge about *C. elegans*. He helped in developing preliminary learning protocols

Natasha working in lab.



Natasha vitrifying worm.

for training the worms, such as tapping on petri dishes which elicits a backing reflex, using lighting stimulation which evokes an avoidance response, and introducing chemical attractants such as Butanone for Pavlovian conditioning.

Risco had introduced me to Daniel Barranco, a current Ph.D. candidate, who is an expert in the Cryotop method of embryo freezing. We had been communicating for many months about various supplies and chemicals. But since Barranco lives in Spain and the phone calls and Skype meetings were becoming lengthy, I invited him to work with me in the lab. His strong skill set was a key factor in our iterative process of exploring options for learning methods, cryopreservation protocols, and testing, retesting, and finally determining a process for accurately assessing the long-term memory retention of the cryopreserved and vitrified worm studies.

Daniel working at hood.

VALIDATION OF MEMORY RETENTION IN STUDIES

The memory retention protocol we used for learning is known as olfactory imprinting. We distinguished this protocol by using the chemical benzaldehyde for phase-sense imprinting on the young worms, just after the larval stage. Olfactory imprinting has been studied in many species, including primates, mammals and humans. The key to successful olfactory imprinting is choosing the correct period of time (window of opportunity) when the organism can develop a long lasting learned response.

Memory retention was validated through a chemotaxis assay of the migration index. The trained worms migrated to areas of the petri dish where the benzaldehyde drops were placed. This showed that they preferred areas of the dish where the chemical smell was detected. Because there is a native reaction to benzaldehyde, the untrained worms preferred other areas of the dish. In sum, the response of the trained worms was double that of the untrained worms, whether they were cryopreserved or not.

ESTABLISHING THE CONTROL GROUP AND EXPERIMENTAL GROUP FOR 10 STUDIES

The research established two groups, the control group and the experimental group. For the control group, we formed eight studies. For the experimental group, we formed two studies. Each of the ten studies from the control group and experimental group contained 100 or more worms each (Table 1). We used the Wild isolate Bristol strain N2 of the *C. elegans* worm, which we obtained from the Caenorhabditis Genetics Center (CGC) at the University of Minnesota.

METHODOLOGY: THREE AREAS OF FOCUS

Our methodology was based on what was already known in the field and what might be the most effective tools and techniques to use. After much deliberation, we decided to incorporate an established method for learning, several methods for cryopreservation, and a chemotaxis assay for observing whether or not the worms had remembered what they learned at the early L1 stage and after cryopreservation and reviving at the adult stage.

1. **Learning Method:** Using the olfactory imprinting method (Remy and Hobert), our studies focused on long-term memory using this olfactory imprinting technique with the chemical attractant benzaldehyde (C6H5CHO). The *C. elegans* habituate to learned smells associated with food and the

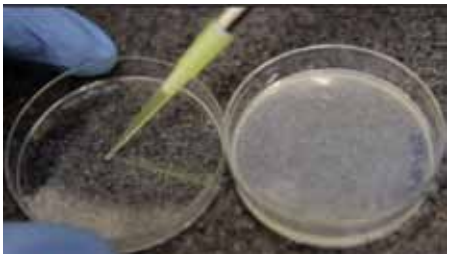
TABLE 1

Description of the studies. The composition of each study is the result of the combination of three different methods: olfactory imprinting (trained or untrained worms), the use of cryoprotectant solutions (vitrification solution or slow freezing solution) and the cryopreservation (vitrification or slow freezing).

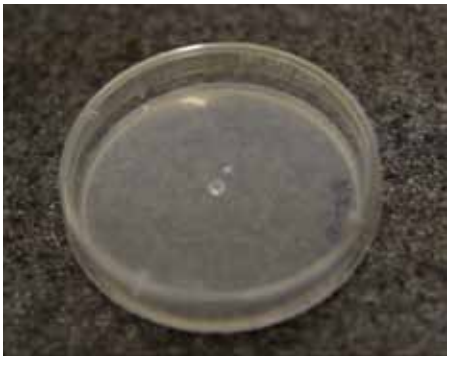
		OLFACTORY IMPRINTING		CRYOPROTECTANT SOLUTIONS		CRYOPRESERVATION	
		Trained (benzaldehyde)	Untrained (distilled water)	Vitrification Solution	Slow Freezing Solution	Vitrification	Slow Freezing
CONTROL GROUP	Study 1	No	Yes	No	No	No	No
	Study 2	Yes	No	No	No	No	No
	Study 3	No	Yes	Yes	No	No	No
	Study 4	Yes	No	Yes	No	No	No
	Study 5	No	Yes	Yes	No	Yes	No
	Study 7	No	Yes	No	Yes	No	No
	Study 8	Yes	No	No	Yes	No	No
	Study 9	No	Yes	No	Yes	No	Yes
EXPERIMENTAL GROUP	Study 6	Yes	No	Yes	No	Yes	No
	Study 10	Yes	No	No	Yes	No	Yes

best results are at an early stage, just after the worm develops from the larva stage. This is the opportune period of time for the animal to develop a long-lasting learned response.

In our experiment, we used 100 or more worms for each study and used the term untrained for worms that we did not imprint with benzaldehyde. For worms that we did expose to the benzaldehyde for olfactory imprinting, we used the term trained. Using the protocol of Remy and Hobert, we placed worms in the untrained group in petri dishes where food *Escherichia coli* (*E. coli*) was available and the dish lids were swiped with distilled water. For the trained group studies, we placed the worms in petri dishes with E.coli where the lids of the dishes were swiped with benzaldehyde, every hour for eight hours.



Swiping lid with benzaldehyde.

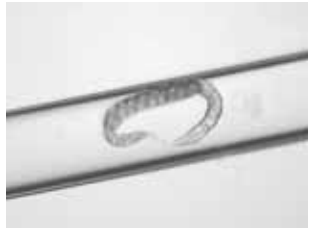


Lid with benzaldehyde.

In the studies, the benzaldehyde was used as an attractant, which developed an association between food and the chemical smell. The aim was to establish whether or not the nematodes could retain the imprinted experience of the chemical smell of benzaldehyde with food into their adult stage, signifying the establishment of long-term memory.

Locating worm.

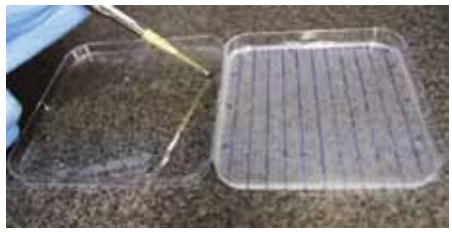
Pulling worm into straw.



Worm in straw.

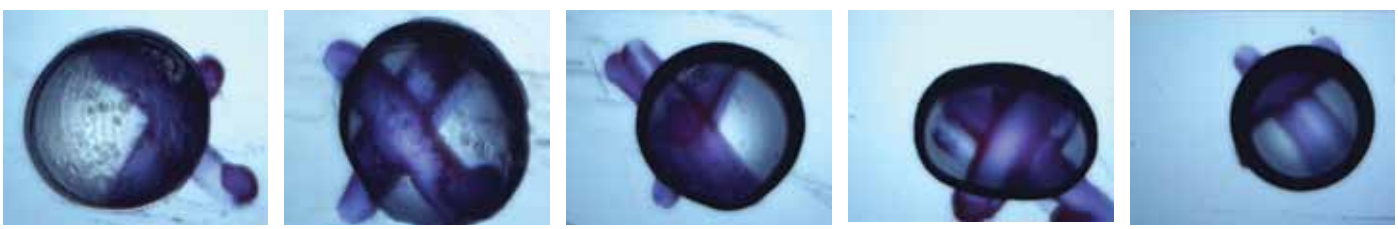
2. **Vitrification and Cryopreservation Process:** The traditional methods for cryopreserving biological samples are through slow freezing and through vitrification, which have different cooling and warming rates. For our research's vitrification, we applied the known method of Cryotop, used in the freezing of embryos. While our research experiment's studies included several methods for cryopreservation, our central focus was the Cryotop protocol indirectly submerging the nematodes into liquid nitrogen using a straw device. One worm at a time was carefully pulled into the straw from the petri dish. From this, we established the effective use of the SafeSpeed closed device (Barranco, et al.), a new technology for ultra-fast warming rates.

3. **Testing Results of Long-Term Memory.** We used a chemotaxis assay five days after olfactory imprinting, when worms reached the adult stage. Marking 12x12 square agar plates, we drew lines marking off areas with assigned values of from -6 to 6 on the outside of the plates. In the first area of the plates, at value -6, we issued three drops of sodium azide at equal spacing into the agar. In the same areas, with the same equal spacing but on the lid of the plates, we issued three drops of plain water. On the other side of the plate, at value 6, we issued the same three drops of sodium azide at equal spacing; but on the lid of this area, we issued three drops of benzaldehyde, instead of water.



Pipetting three drops sodium azide.

Pipetting three drops benzaldehyde.



X marked locations on the square agar plates.

TABLE 2

Number of worms for each type of study and Migration Index Mean. Type of study (S), number of worms (NW), number of chemotaxis assay (NCA), migration index mean (MI), standard error (SE), and p-value on the ANOVA test (p).

Types of studies from (S) 1 through 10: S1: untrained and not vitrified; S2: trained and not vitrified; S3: untrained, not vitrified and cryoprotectant solution; S4: trained, not vitrified and cryoprotectant solution; S5: untrained and vitrified; S6: trained and vitrified; S7: untrained, no slow freezing and cryoprotectant solution; S8: trained, no slow freezing \ and cryoprotectant solution; S9: untrained and slow freezing; and S10: trained and slow freezing.

S	*NW*	*NCA*	*MI*	*SE*	*p*
1	110	6	1.34	0.36	
2	169	11	4.23	0.21	
3	115	7	2.00	0.38	
4	121	6	3.75	0.13	
5	122	8	1.62	0.15	0.00
6	128	8	3.51	0.11	
7	108	6	1.51	0.23	
8	115	6	3.91	0.18	
9	114	6	1.73	0.25	
10	118	6	3.37	0.13	

Our continuous recording of the research provides sufficient visualization of the process, as well as distinct instances showing where the worms migrated.

A series of processes included using a platinum wire to pick up revived worms from the petri dish with food, to a petri dish without food, and after numerous minutes, transfer them onto the square plate to time and observe where they migrated to. This was the Migration Index (MI). The statistical analysis for each study was tested with the Levene test, ANOVA test, and Tahame test (Table 2).

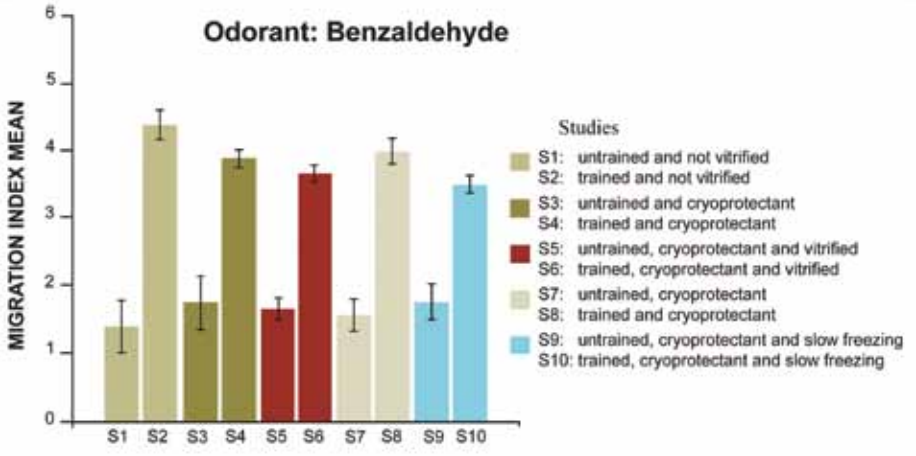
A BRIEF DESCRIPTION OF THE RESEARCH RESULTS

The research shows the first results related to persistence of long-term memory of *C. elegans* after vitrification and reviving. I, along with Daniel Barranco, describe the results in our paper in *Rejuvenation Research* (October 2015 issue):

> "The survival rates for our study did not show deviation from the expected original slow freezing method of Brenner or the SafeSpeed method of Barranco. The survival rate for slow freezing with L2-L3 worms was <20%, and for vitrification was <100%" (Vita-More & Barranco, 2015)."

FIGURE 2

Explanation of migration of untrained and trained worm studies: S1 (untrained and not vitrified) and S2 (trained and not vitrified); S3 (untrained and cryoprotectant) and S4 (trained and cryoprotectant); S5 (untrained, cryoprotectant and vitrified) and S6 (trained, cryoprotectant and vitrified); S7 (untrained and cryoprotectant) and S8 (trained and cryoprotectant); S9 (untrained, cryoprotectant and slow freezing) and S10 (trained, cryoprotectant and slow freezing).



A NECESSARY FUTURE FOR RESEARCHING MEMORY RETENTION OF CRYONICS PATIENTS

The Alcor Research Center work has been a wonderful opportunity to build a project related to cryonics. I would like to lead a team or advise a team. As for extending *C. elegans* research, I would like to explore alternative learning methods at different maturity stages of the worm. Also, more work is needed to find out if a few or all memory mechanisms are unaffected by the Benzaldehyde and/or vitrification. Beyond this, I am interested in testing memory of larger organisms with a more complex central nervous system and leave others to continue the research that I and Barranco completed. If I could do similar research in an animal with a more complex nervous system, I might consider cold-tolerant species that live suspended in a frozen state during winter seasons and thaw in the warmer seasons. The Greenland Woolly Bear Caterpillar is a species that is active for a mere 30 days of the full 365 days in a year, and then goes dormant in self-made cocoons. These cocoons are cleverly attached to rocks and the cocoon coverings form tiny biosphere greenhouses. Another species is the Alaskan Wood Frog, an amphibian that freezes solid through the winter and defrosts in the spring. Nevertheless, after working with *C. elegans*, which naturally have rhythmic movements that are visually pleasing and emotionally alluring, it would be difficult to work with a leech, which is another option. The ozobranchid leech, a parasite that attaches itself to freshwater turtles, is a highly tolerant organism to freezing conditions and thawing, repeatedly. The downside is that these leeches can carry viruses that form cauliflower-like tumors on the turtles, impairing their health and survival rate. So here is a note of caution; however, they are known not to affect humans.

Vitrified and revived worm in orange food coloring (Barranco, 2014).

GENERAL REFLECTIONS ON THE RESEARCH

In the first few weeks, there were over 16,000 downloads of our paper, which is published ahead of print at *Rejuvenation Research's* online site, http://online.liebertpub.com/doi/10.1089/rej.2014.1636. As of today, August 16th, there have been more than 16,000 downloads. I would have been delighted if 600 people downloaded our paper from the publisher's site. Writing the paper was not an easy task. It took considerable attempts to adjust the language and formatting, which is quite different from a doctoral dissertation in style. The critical and highly valued blind peer-reviewed comments were enormously helpful. And persistence paid off once again, and the paper is scheduled for the printed October issue of *Rejuvenation Research*. The next step is to take the array of video footage and edit it into a visual documentation of the research and a stunning graphic narrative. The aim is to capture the research studies with visuals, similar to the rhythmic movement of the *C. elegans* as they skim to and fro across the agar in the petri dish.

AN UNEXPECTED INCIDENT

An unexpected incident occurred after I had vitrified a worm and took it from the warming bath to the petri dish with agar. I was carefully watching it to check on its behavioral movements. Looking through the microscope, I noticed some bubbles, or what I thought were air bubbles I had mistakenly emitted from the straw. But as I began to notice, four bubble-like shapes were not air bubbles. They started moving. Over the next minute or so, all four larvae had hatched and were healthy looking new baby worms. The vitrified and revived worm's eggs were hatching before our eyes. This was one of the most thrilling moments. ■

C. elegans *lays four eggs after vitrification and reviving. (Vita-More 2014).*

REFERENCES:

Vita-More, N, Barranco, D. Persistence of Long-Term Memory in Vitrified and Revived *C. elegans*. *Rejuvenation Research*. (doi: 10.1089/rej.2014.1636).

Brenner S. The genetics of Caenorhabditis elegans. *Genetics*. 1974;77(1):71-94.

Barranco D, Cabo V, Corral A, Risco R. Vitrification of *Caenorhabditis elegans* by ultrafast warming rates. *Nature Methods* (in preparation). 2014.

Fahy GM, MacFarlane DR, Angell CA, Meryman HT. Vitrification as an approach to cryopreservation. *Cryobiology*. 1984;21(4):407-426.

Fahy GM, Wowk B, Pagotan R, et al. Physical and biological aspects of renal vitrification. *Organogenesis*. 2009;5(3):167-175.

Remy JJ, Hobert O. An interneuronal chemoreceptor required for olfactory imprinting in *C. elegans*. *Science*. 2005;309(5735):787-790.

About The Author

Dr. Natasha Vita-More is a full time Faculty member and the Graduate Studies Program Champion (Chair) at the University of Advancing Technology. She earned her Ph.D. in Emerging Technology and Design at the University of Plymouth, UK, and a Master of Science from the University of Houston. Her doctoral dissertation outlines the study of life expansion as a framework for design-based approaches concerned with prolonging human life and sustaining personal identity. Natasha is Chair of Humanity+ and a Fellow at the Institute for Ethics and Emerging Technologies. She has been an invited speaker on human enhancement at the International SportAccord Convention for Olympic and non-Olympic sports, the TOPOS Conference in Tokyo on the world's aging population, Russia's Geek Picnic, and at Berlin's CityCube. She has been published in numerous academic, scientific, and design journals. She has been called an "early adopter of revolutionary changes" and a "role model for superlongevity" (*Wired* magazine), and has appeared in over twenty-four televised documentaries on the future. She lectured at Harvard, Yale, Stanford, Virginia Commonwealth, Aalto (Finland), and Polytechnic (Hong Kong) universities. Her book, *The Transhumanist Reader: Classical and Contemporary Essays on the Science, Technology, and Philosophy of the Human Future* (Eds. More, M. and Vita-More, N, 2012), published by Wiley-Blackwell, is the foundational collection of ideas and essays by 42 authors on the human future.
Image: Steve Graber, Photographer 2014.

REDUCE YOUR ALCOR DUES WITH THE CMS WAIVER

Alcor members pay general dues to cover Alcor's operating expenses and also make annual contributions to the Comprehensive Member Standby fund pool to cover the costs of readiness and standby. Benefits of Comprehensive Member Standby include no out-of-pocket expense for standby services at the time of need, and up to $10,000 for relocation assistance to the Scottsdale, Arizona area.

Instead of paying $180 per year in CMS dues, Alcor also provides members the option to cover all CMS-associated costs through life insurance or pre-payment. Members who provide an additional $20,000 in minimum funding will no longer have to pay the $180 CMS (Comprehensive Member Standby fund) fee. This increase in minimums is permanent (for example, if in the future Alcor were to raise the cost of a neurocryopreservation to $90,000, the new minimum for neurocryopreservation members under this election would be $110,000). Once this election is made, the member cannot change back to the original minimums in the future.

To have the CMS fee waived, these are the minimums:

- **$220,000 Whole Body Cryopreservation ($115,000 to the Patient Care Trust, $60,000 for cryopreservation, $45,000 to the CMS Fund).**
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If you have adequate funding and would like to take advantage of the CMS waiver, contact **Diane Cremeens at diane@alcor.org.**

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Supporters of Alcor who are not yet ready to make cryopreservation arrangements can become an Associate Member for $5/month (or $15/quarter or $60 annually). Associate Members are members of the Alcor Life Extension Foundation who have not made cryonics arrangements but financially support the organization. Associate Members will receive:

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- **Access to post in the Alcor Member Forums**
- **A dollar-for-dollar credit toward full membership sign-up fees for any dues paid for Associate Membership**

To become an Associate Member send a check or money order ($5/month or $15/quarter or $60 annually) to Alcor Life Extension Foundation, 7895 E. Acoma Dr., Suite 110, Scottsdale, Arizona 85260, or call Marji Klima at (480) 905-1906 ext. 101 with your credit card information.

Or you can pay online via PayPal using the following link: http://www.alcor.org/BecomeMember/associate.html (quarterly option is not available this way).

Associate Members can improve their chances of being cryopreserved in an emergency if they complete and provide us with a Declaration of Intent to be Cryopreserved (http://www.alcor.org/Library/html/declarationofintent.html). Financial provisions would still have to be made by you or someone acting for you, but the combination of Associate Membership and Declaration of Intent meets the informed consent requirement and makes it much more likely that we could move ahead in a critical situation.

ARE YOU GETTING Curcumin's BENEFITS?

Curcumin is the health-promoting trace compound derived from the Indian spice **turmeric**. But not all turmeric is alike.

The curcumin found in the vast majority of dietary supplements is derived from turmeric that is **nutritionally inferior**.

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The turmeric root requires more time in the ground for highly beneficial phytonutrients called ***curcuminoids*** and ***sesquiterpenoids*** to attain peak concentrations.

Life Extension®'s Super Bio-Curcumin® derives from turmeric that is grown with organic practices, cultivated to maturity, then specially transported and processed to preserve and deliver the root's most complete nutritional profile.

In recent studies comparing the effects of standard curcumin against turmeric extracts comparable to **Super Bio-Curcumin®**, researchers observed:[1,2]

- Nearly twice the support for **immune** health.
- Approximately twice the support for **inflammatory** issues.
- Almost double the **antioxidant** support.

A separate study indicated that an antioxidant-rich curcumin extract[3] provided powerful support for heart health.

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Curcumin is neither absorbed nor *retained* well in the blood, which is another challenge facing those who wish to maximize its benefits.

The highly popular **Super Bio-Curcumin®** uses **BCM-95®**, a patented, *bioenhanced* preparation of curcumin. It has been shown to reach up to **7 times higher concentration** in the blood than standard curcumin.[4]

The graphs on this page illustrate that one **400 mg** vegetarian capsule per day of **Super Bio-Curcumin®** supplies the equivalent of **2,500 mg** of commercial curcumin supplements.

A bottle containing 60 vegetarian capsules of **Super Bio-Curcumin®** retails for $38. If a member buys four bottles, the price is reduced to only **$26.25** per bottle.

Item # 00407

References

1. *Int J Pharmacol.* 2009;5(6):333-45.
2. *J Food Nutr Res.* 2009;48(3):148-52.
3. *Arch Gerontol Geriatr.* 2002;34:37-46.
4. *Indian J Pharm Sci.* 2008 Jul-Aug;70(4):445-9.
5. Bioavailability study of BCM-95® in rats. Orcas International Inc. 2006.

CAUTION: Do not take if you have gallbladder problems or gallstones. If you are taking anti-coagulant or anti-platelet medications, or have a bleeding disorder, consult your healthcare provider before taking this product.

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How Much Curcumin Are You Absorbing?

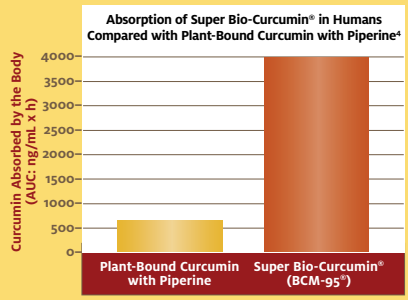


Chart 1. Super Bio-Curcumin® (BCM-95®) showed 6.3 times greater bioavailability (absorption and sustainability over 8 hours) in humans compared with plant-bound curcumin with piperine (as measured by the area under the curve [AUC] in a plot of blood levels against time, that is, the total amount of curcumin absorbed by the body over 8 hours).

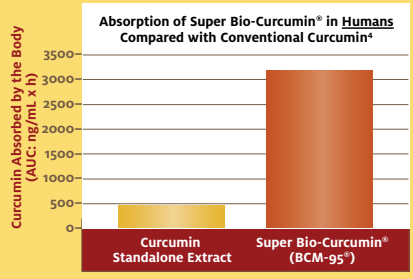


Chart 2. Super Bio-Curcumin® (BCM-95®) showed 6.9 times greater bioavailability (absorption and sustainability over 8 hours) in humans compared with conventional curcumin (as measured by the area under the curve [AUC] in a plot of blood levels against time, that is, the total amount of curcumin absorbed by the body over 8 hours).

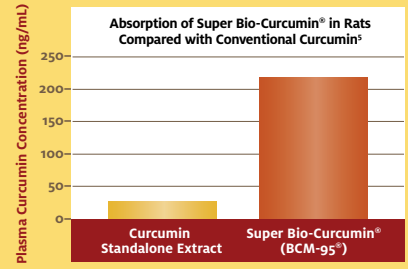
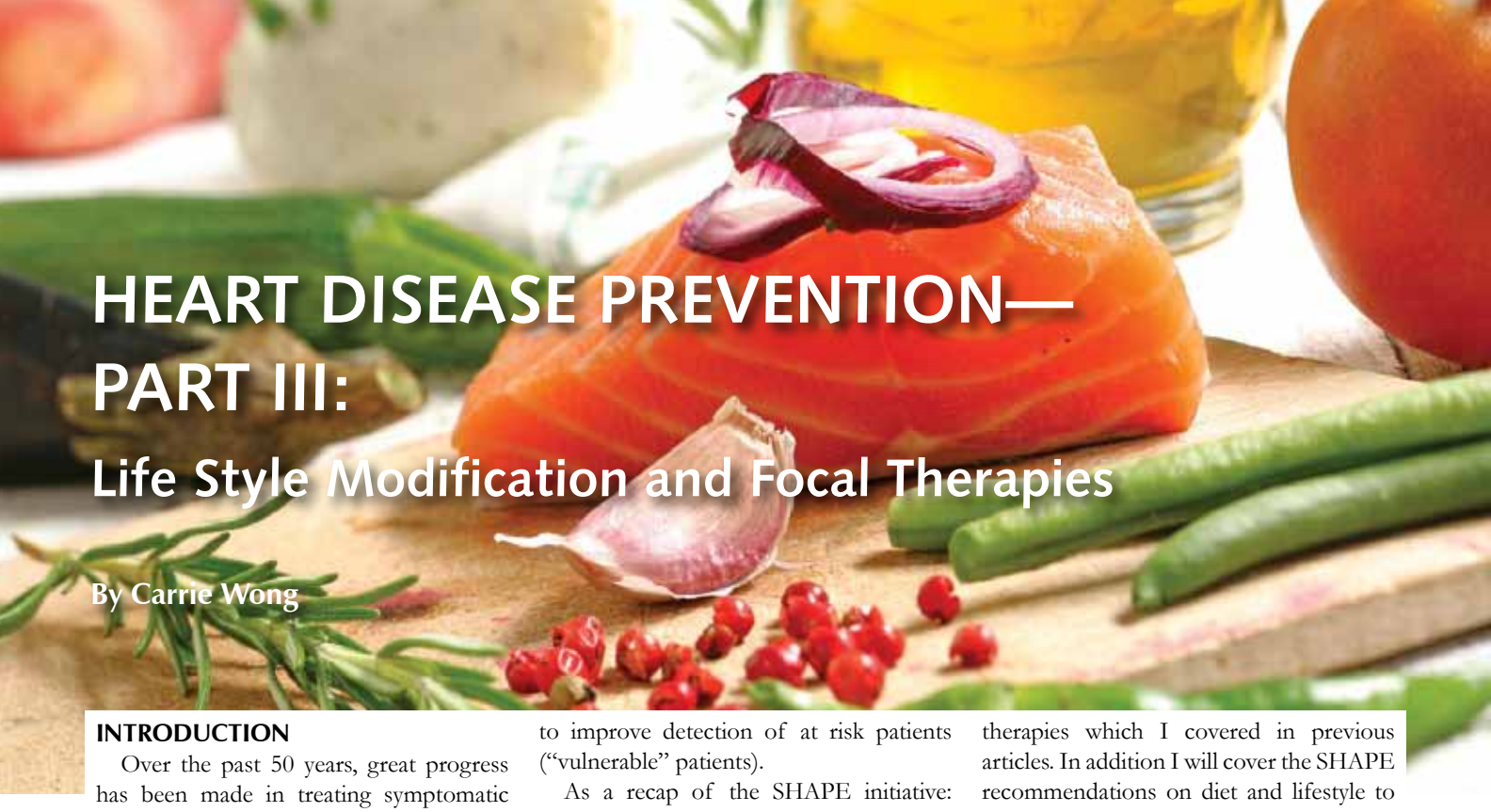


Chart 3. Bioavailability in rats fed with BCM-95® is 7.8 times higher than conventional curcumin.



HEART DISEASE PREVENTION—PART III:

Life Style Modification and Focal Therapies

By Carrie Wong

INTRODUCTION

Over the past 50 years, great progress has been made in treating symptomatic cardiovascular disease but little progress has been made for asymptomatic cardiovascular disease which is the leading cause of sudden death. Many individuals, even those with severe atherosclerosis, are unaware of their risk because of a complete lack of symptoms. In 30-50% of these individuals, the first indication of the disease is an acute heart attack, which is often fatal (Naghavi, 2010, pg. 77). As cryonicists, we have to pay special attention to preventing sudden death to ensure a timely cryopreservation.

In my previous two articles, *Heart Disease Prevention – Part I and Part II,* I gave an introduction to **"Asymptomatic Atherosclerosis – Pathophysiology, Detection and Treatment"** By: Morteza Naghavi, MD[1]. This is part three of my three-part summary of this extensive 700 page volume outlining the Society for Heart Attack Prevention and Eradication (SHAPE) initiative. In part one I gave a brief summary of the pathophysiology of atherosclerotic cardiovascular disease (ACVD) as well as SHAPE's guideline for what constitutes a "vulnerable" patient. In part two, I covered additional risk factors, targeted therapy for vulnerable patients and preventive drugs (polypills). In my previous articles I covered the limitations of traditional risk assessment tools as well as the proposed SHAPE guidelines to improve detection of at risk patients ("vulnerable" patients).

As a recap of the SHAPE initiative: there should be non-invasive screening of all asymptomatic men 45-75 years of age and all asymptomatic women 55-75 years of age to detect and potentially treat those with subclinical atherosclerosis. Non-invasive screening methods include carotid ultrasound, high coronary calcium quantification, computerized tomography or reduced ankle-brachial index. With non-invasive screening, the "vulnerable patient" can be discovered. If a vulnerable patient is discovered, even if they are asymptomatic, they should undergo immediate preventive medicine. Vulnerable patients or patients who have intermediate risk should take anti-oxidants (vitamin E, arotenoids and polyphenolic flavonoids) and consult a physician to undergo LDL targeted therapy such as statins. In addition, polypills could be developed for population-based therapy. Currently doctors recommend low-dose aspirin for men over 45 and women over 50 years of age because age is the greatest risk factor in determining cardiovascular risk. In part II, I cover preventive therapies for intermediate-risk patients, but if vulnerable plaques are discovered with non-invasive screening, further action must be taken.

In this article I cover additional population-based therapies and local therapies to stabilize vulnerable plaques. This goes beyond non-invasive preventive therapies which I covered in previous articles. In addition I will cover the SHAPE recommendations on diet and lifestyle to prevent ACVD.

SYSTEMIC THERAPY: VACCINES

Atherosclerosis is now recognized to be a chronic immune-mediated inflammatory disease. Both systemic and local inflammation play a prominent role in the pathogenesis of atherosclerosis and its clinical complications. Inflammatory processes accompany all stages of atherosclerosis and in my previous article I covered inflammation screening methods using novel biomarkers. The lesions that form contain both innate and adaptive immune system responses (Naghavi, 2010, pg. 650). To this end researchers have developed immune-modulation vaccines in an attempt to reduce atherosclerosis.

In several observation studies, it was shown that the influenza vaccination is associated with reduced cardiovascular events such as heart attacks or stroke responses (Naghavi, 2010, pg. 654). In one small randomized control trial, it was shown that an influenza vaccination (FLUVAC) reduced the risk of cardiovascular death in patients with pre-existing ACVD. As a result of these studies, the American Heart Association and American College of Cardiology recommend the influenza vaccine as a secondary preventive measure for patients with ACVD. So there is already a precedent for vaccinations as a preventive

measure although the exact mechanism of effect remains unclear.

Historically, in the search for a vaccination specifically for ACVD, native LDL or modified LDL has been the major immunogen used in active immunization. This active immunization against atherosclerosis has been tested in animals (Naghavi, 2010, pg. 653). Studies have shown that immunization using native or modified LDL reduces atherosclerosis in rabbits and mice. However the underlying mechanisms and identity of antigens presented by whole LDL or modified LDL remain elusive. This has made translation into a clinical setting difficult. Additional problems include isolation in large quantities and overall safety of such studies.

Limited data show that immunization favorably changes the composition of established plaques which is indicated by decreased plaque inflammation and increased collagen content (Naghavi, 2010, pg. 654). However, further studies need to be conducted to fully realize the underlying mechanism in which immunization reduces atherosclerosis. Currently, researchers are looking into optimal immunogens, adjuvants, route of administration and effective frequency of immunization.

LOCAL THERAPIES: DRUG-ELUTING STENTS

Drug-eluting stents (DES) are a type of "scaffold" placed in narrowed, diseased coronary arteries that slowly release drugs that block cell proliferation. This prevents fibrosis, a buildup of arterial lesions and clots that could block arteries. Currently, drug-eluting stents (DES) are used in cases of restenosis, where the patient's blood vessels are narrowed by atherosclerosis (Naghavi, 2010, pg. 661). However, the use of DES could be used in treating intermediate coronary lesions and vulnerable plaque (VP). The majority of heart attacks are triggered by the rupture of VP, frequently at noncritical sites in our circulatory system. Treating vulnerable plaque (VP) is only possible by accurately stratifying risk in patients (Naghavi, 2010, pg. 662). Vulnerable plaque can be identified with modern diagnostic imaging methods. There is evidence that this approach is safe and effective but proper risk stratification of intermediate lesions is central to this approach.

Atherosclerosis is a systemic disease affecting many arterial vessels, but it has been demonstrated that most cases of fatal heart attacks result from a single blood clot over a ruptured or eroded plaque (Naghavi, 2010, pg. 664). Certain areas of the coronary arteries, based on locations of culprit lesions and VP are responsible for acute coronary syndrome. Acute coronary syndrome (ACS) is sudden restriction of blood flow to the heart usually accompanying heart attacks. Most of the lesions that cause ACS occur within 30mm of major coronary arteries (Naghavi, 2010, pg. 664). Because VPs are localized and the risk of ACS is associated with a relatively limited length of the artery, it is possible to administer local therapy at those sites.

Improvements in stent technology (drug-eluting and bio-absorbable) have led to new devices that have reduced the long-term risks of this intervention, including that of stent thrombosis (Naghavi, 2010, pg. 668). Stent thrombosis is a critical side-effect that could result in fatal cardiac arrest for a small percentage of users. Doctors must carefully weigh the risk and benefit ratio of DES on an individual basis for preventive stenting of VPs. In addition, despite promising results from a number of clinical studies, randomized control studies are needed to determine the efficacy and safety of DES (Naghavi, 2010, pg. 665).

DIETARY MANAGEMENT

The most effective way of improving survival in patients with atherosclerotic cardiovascular disease (ACVD) is to focus on prevention. In my previous article, I covered the dietary anti-oxidants studied in the context of preventing inflammation including vitamin E, carotenoids and polyphenolic flavonoids. These anti-oxidants are effective in preventing inflammation, however the most effective and complete dietary approach to preventing ACVD is the Mediterranean Diet. The Mediterranean diet has been shown to be most effective in epidemiological studies with etiological (cause-based) approaches and in controlled clinical trials (Naghavi, 2010, pg. 689). This is in contrast with cholesterol-lowering treatments that have provided conflicting results in terms of mortality. The majority of the published research on the Mediterranean diet has yielded positive results, especially in terms of reducing mortality.

The Lyon Diet Heart Study was the first clinical trial to demonstrate the beneficial effects of the Mediterranean diet in reducing heart disease (Lorgeril, 1999). It was a prospective randomized, single-blind, multi-clinic secondary prevention trial aimed at testing whether a Mediterranean-type diet could reduce the rate of recurrence after the first heart attack. The result of the Lyon Heart Study was that there was a strong protective effect after 27 months of follow-up (Lorgeril, 1999). In addition this protective effect was maintained up to four years after the first coronary event. All epidemiological studies have supported the results of the Lyon Diet Heart Study and show how protective the Mediterranean diet is against fatal complications (Naghavi, 2010, pg. 690). In contrast, cholesterol-lowering drug trials have conflicting results and are often negative in terms of protection from mortality. Recent statin trials in secondary prevention of coronary heart failure patients yielded negative results: it was ineffective. Interestingly, in clinical trials, the Mediterranean Diet did not alter major conventional risk factors (Naghavi, 2010, pg. 691). There were no differences in blood cholesterol, blood pressure and body weight between the two groups. This suggests that the protective effects of the MD are independent of traditional risk factors.

WHAT IS IN THE MEDITERRANEAN DIET? (NAGHAVI, 2010, PG. 691)

1. A variety of raw, sometimes cooked, seasonal vegetables throughout the year, often associated with large amounts of onions, garlic, parsley, rosemary, oregano, thyme and other aromatic herbs.
2. Fruit throughout the year, both fresh and dried.
3. Various nuts (almonds, hazelnuts), particularly walnuts that are rich in alpha-linolenic acid (ALA), and the main plant omega-3, a major characteristic of traditional Mediterranean diets.
4. Grains, preferably whole, especially wheat in the form of bread, fermented with natural leaven and sometimes flavored with ALA-rich linseed. The wheat used in traditional Mediterranean diets (like the vegetables and fruit) does not contain pesticides as it is not a product of industrial agriculture.

5. Fatty fish, including anchovy, sardine, mackerel, sea bream and red tuna, all rich in very-long chain (marine) omega-3 fatty acids. Another source of indispensable marine omega-3 fatty acids may be the eggs of linseed fed chicken, as well as the fish-like effect of moderate wine drinking.
6. Olive oil, the main edible oil used around the Mediterranean area, low-saturated and rich-mono-unsaturated.
7. In contrast with many experts, Mediterranean populations do traditionally eat dairy products, though made of goat and ewe's milk and not cow's milk. Notably, these are consumed under the fermented forms of cheese and yogurt, and almost never as milk, butter or cream.
8. Mediterranean populations are not vegetarian. They eat ALA-rich eggs and small amounts of meat, mainly lean meat such as rabbit, chicken and duck. Beef and/or pork are also on the menu in the North of the area, while mutton is the preferred meat for festive meals in the South. It is also important to note that everywhere in the Mediterranean area the diet includes a lot of legumes and is therefore rich in vegetable proteins.
9. Moderate alcohol consumption, essentially during meals, is a major characteristic of the Mediterranean diet. The main alcoholic beverage is wine, particularly red wine, a major source of various polyphenols. South of the Mediterranean Sea, the main source of healthy polyphenols is not wine but fermented black tea. Thus most people living in the Mediterranean area are high consumers of various polyphenols whose health effects are still considerably underestimated by scientists and physicians.

PHYSICAL EXERCISE

The majority of the population is aware that higher levels of physical activity are associated with lower risk of cardiovascular disease. This protective effect applies to both high and low risk patients. Regular exercise improves insulin resistance, lipid profiles, and blood pressure control, has anti-oxidant effects, and reduces psychological stress in vulnerable patients (Naghavi, 2010, pg. 699). However much of the risk-reduction related to exercise cannot be explained by reductions in traditional cardiovascular risk factors. In addition, physical activity also has an effect on novel cardiovascular risk factors such as inflammatory markers.

RECOMMENDATIONS FOR BOTH LOW-RISK AND VULNERABLE PATIENTS

Current guidelines recommend 30 minutes or more of moderate physical activity like brisk walking on most days of the week. Sedentary lifestyles are a major contributor to the development of atherosclerotic cardiovascular disease (ACVD). In one study it was shown that exercise capacity was a more powerful predictor of cardiovascular mortality than other established risk factors such as smoking, high blood pressure, high cholesterol, and diabetes (Naghavi, 2010, pg. 700). The average person without ACVD or subclinical ACVD should follow the current guidelines, however those already with ACVD can still benefit greatly from exercise.

The positive effects of physical activity extend to patients with cardiovascular disease and there's considerable evidence that it reduces cardiac mortality in secondary prevention. Exercise-related adverse cardiovascular events are very rare but there is a greater risk of heart attack during intense exercise (Naghavi, 2010, pg. 703). This risk is greater in sedentary patients than in patients with a history of regular exercise. The American Heart Association (AHA) and American College of Sports Medicine both have guidelines that suggest that all sedentary men over 45 years of age and all women over 55 years of age with risk factors should undergo a health screening and exercise stress testing with an electrocardiogram before enrolling in any vigorous exercise program (Naghavi, 2010, pg. 703). These sedentary patients are considered vulnerable patients and should be eased into an exercise program. Vulnerable patients should be encouraged to adopt lifestyle changes such as using stairs instead of elevators, parking their car farther away or doing yard work. The AHA also recommends a supervised resistance training regimen to enhance muscular strength, functional capacity and quality of life in persons with or without cardiovascular disease. The AHA suggests 8-10 repetitions of 50% for healthy individuals and 12-15 repetitions of 30-40% for patients with cardiovascular disease.

CONCLUSION

Cardiovascular disease manifested by heart attack and stroke continues to be the leading cause of death in the world. In this three part series, I have attempted to summarize the most important finding in "Asymptomatic Atherosclerosis – Pathophysiology, Detection and Treatment" By: Morteza Naghavi, MD. Although I covered many topics in my series of articles, this book is an extensive 700 page volume and there were a number of topics I had to gloss over. However, I believe I did some justice in outlining the Society for Heart Attack Prevention and Eradication (SHAPE) initiative. Asymptomatic atherosclerosis can cause sudden death, but with new methods to identify the vulnerable patient, subclinical atherosclerosis can be identified and treated. Age is the biggest risk factor in ACVD, but young people can take steps today to slow down or halt the progression of atherosclerosis. Lifestyle changes such as changing to a Mediterranean Diet or regular exercise can drastically reduce mortality and improve the quality of life in both healthy individuals and those with cardiovascular disease. Improved screening methods and additional biomarkers can detect asymptomatic atherosclerosis. We are approaching a future where this disease can be detected and treated with or without showing symptoms. ■

REFERENCES:

1. Naghavi, Morteza et al. (2010). Asymptomatic Atherosclerosis - Pathophysiology, Detection and Treatment. New York: Springer Science. doi:10.1007/978-1-60327-179-0
2. Lorgeril, Michel, et al. (1999). Mediterranean diet, traditional risk factors, and the rate of cardiovascular complications after myocardial infarction: final report of the Lyon Diet Heart Study. Circulation. 1999;99:779-785. doi: 10.1161/01.CIR.99.6.779

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	Retail Price	Member Price
1 bottle	$32	**$24**
4 bottles	$28 each	**$21 each**
10 bottles	$22.73 each	**$17.05 each**

References
1. *Public Health Nutr*. 2006 Dec;9(8A):1136-40.
2. *Am J Prev Med*. 2005 Nov;29(4):335-46.
3. *J Am Diet Assoc*. 2005 Mar;105(3):428-40.
4. *Nutrition*. 2005 Feb;21(2):131-6.
5. *Biochem Biophys Acta*. 2004 Jun 1;1682(1-3):80-91.

Note: While the health benefits of omega-3s from fish oil are universally recognized, the critical importance of olive oil in maintaining healthy vascular function remains largely overlooked.

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ALCOR 2015 CONFERENCE

October 9-11, 2015

The Alcor 2015 Conference will be held on October 9-11, 2015 at the Scottsdale Resort and Conference Center at McCormick Ranch, located at 7700 East McCormick Parkway, Scottsdale, AZ 85258.

HOTEL ROOMS:
The room rate is **$179** per night plus 13.5% sales tax. The suites are **$279** per night. Attendees must contact hotel at least 30 days before to identify themselves as part of the group.

REGISTRATION:
Note: Alcor will waive the normal $90 Membership Application Fee for conference attendees joining Alcor.

August 1 to September 7: **$345** ($365 non-members)

From September 8: **$385** ($405 non-members)

You may register with the PayPal button below (PayPal account not required), with a credit card by calling Bonnie Magee at Alcor: **1-877-462-5267 ext. 114** or by sending a check to:

Alcor Life Extension Foundation
7895 East Acoma Drive Suite 110
Scottsdale, Arizona 85260

Sunday afternoon tour and cookout: The tour is free, but if you want the catered lunch, add $20 to your registration.

THEMES (Stay tuned for speaker list)

- A once-in-three-years opportunity to meet and catch up with over 200 people involved in cryonics.
- Learn about new approaches to eliminating fracturing, by Greg Fahy, Robert McIntyre, Mark Voelker, and others.
- Learn about new medication protocols to improve biological viability prior to cryopreservation.
- Hear how researchers continue to pursue reduced cryoprotectant toxicity.
- See a multimedia presentation by Natasha Vita-More on memory preservation throughout vitrification.
- Discover the latest findings from Alcor's CT-scanning project.

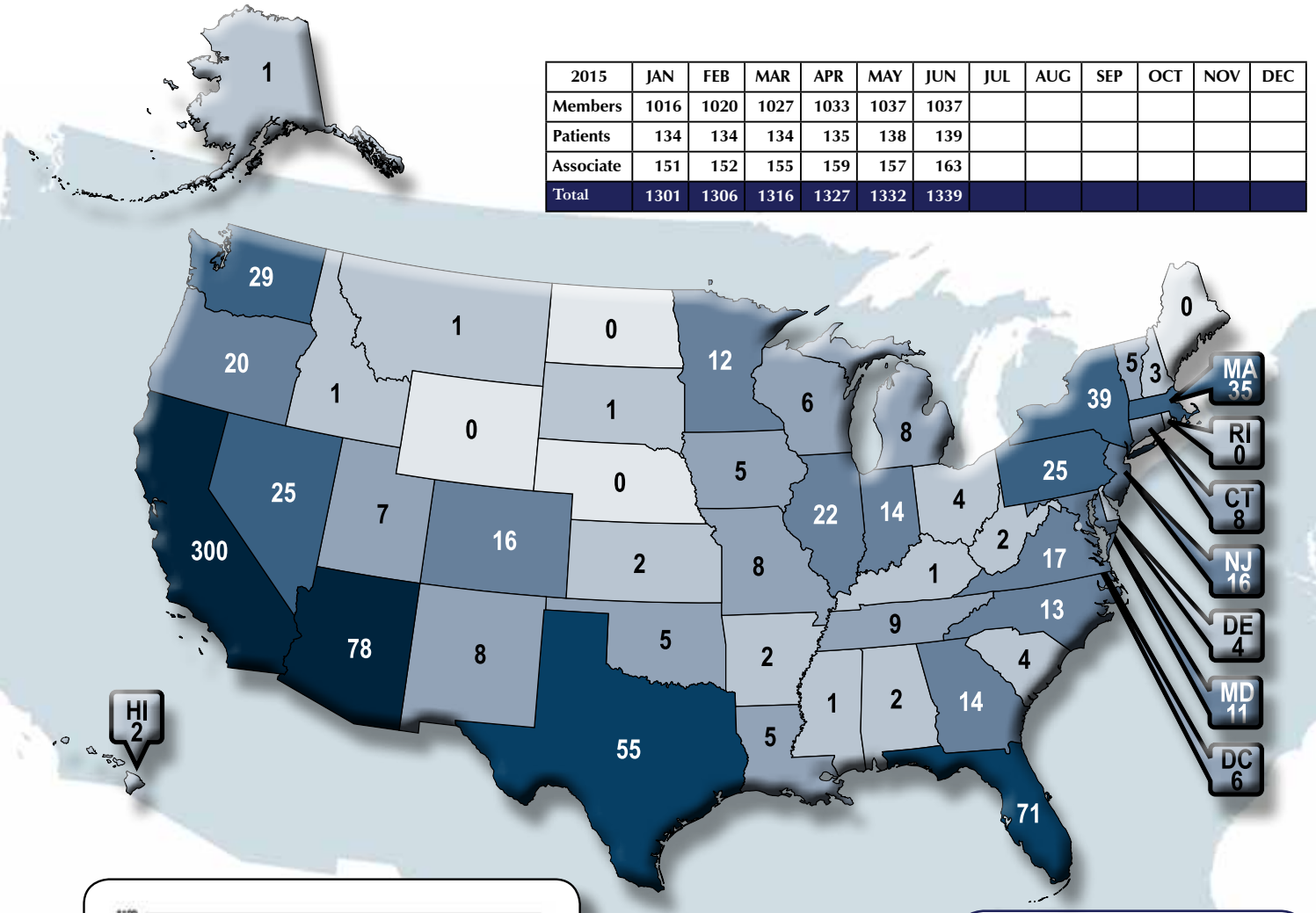
- Learn how to more effectively communicate why cryonics and radical life extension are feasible and desirable from David Kekich, Joe Polish, Jim Strole, Max More, John Bevens, and others, and leave with a take-away action pack.
- You will hear how Alcor works with hospitals and hospices from Chrissy Bird, Executive Director, Seasons Hospice & Palliative Care of Arizona, Aaron Drake, Alcor's Medical Response Director, and Catherine Baldwin, Chief Operating Officer Suspended Animation.
- Other speakers include Martine Rothblatt, and one or two famous mystery speakers (to be confirmed).
- Stay around for the Sunday afternoon cookout and tour of Alcor. If you haven't seen inside Alcor for a few years, you will find that a lot has changed! Computerized perfusion, internal and external aesthetic changes, infographic display room, 3-D printers, new television commercials for Alcor, and much more.

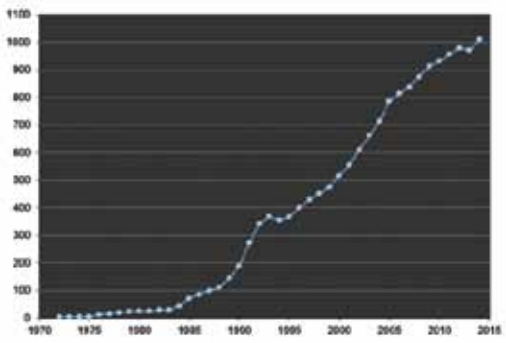
CONFERENCE SCHEDULE

Friday • October 9, 2015	
5:00 pm – 8:00 pm	Registration
7:00 pm – 10:00 pm	Reception
8:00 pm	Welcome Address
10:00 pm until late	Networking
Saturday • October 10, 2015	
7:30 am – 12:00 pm	Registration
7:30 am – 8:30 am	**Breakfast**
99:00 am – 9:20 am	Opening by Alcor President
9:20 am – 9:50 am	Opening address and welcome from senior political figures in Arizona
9:50 am – 11:00 am	Research Session 1
11:00 am – 11:20 pm	Break
11:20 am – 12:30 pm	Research Session 2
12:30 pm – 2:15 pm	**Lunch**
2:15 pm – 3:45 pm	Fracturing Research
3:45 pm – 4:10 pm	Break
4:10 pm – 5:30 pm	How Alcor and Suspended Animation Work with Hospitals and Hospices
7:00 pm – 10:00 pm	**Banquet Dinner**
8:30 pm	Banquet Dinner Speaker
Sunday • October 11, 2015	
7:00 am – 9:00 am	**Breakfast**
9:30 am – 10:00 am	Martine Rothblatt
10:00 am – 10:15 am	Presentation on new book collection *The Best of Cryonics*
10:15 am – 10:25 am	Break
10:25 am – 11:00 am	Mystery speakers
11:15 am – 1:00 pm	Effective Communication about Cryonics and Radical Life Extension
2:00 pm – 6:00 pm	**Alcor Open House & Cookout**

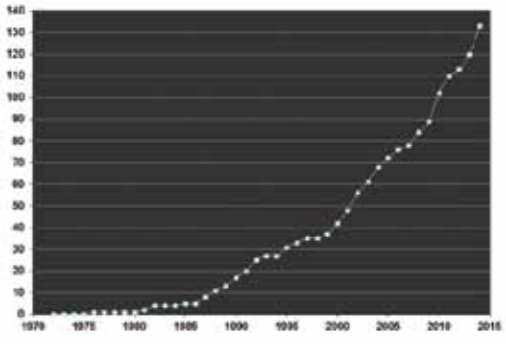
Membership Statistics

2015	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Members	1016	1020	1027	1033	1037	1037						
Patients	134	134	134	135	138	139						
Associate	151	152	155	159	157	163						
Total	1301	1306	1316	1327	1332	1339						





Number of Alcor members



Number of Alcor patients

- 0 Members
- 1–4 Members
- 5–9 Members
- 10–24 Members
- 25–49 Members
- 50–74 Members
- 75+ Members

International

Country	Members	Patients
Australia	10	3
Austria	1	0
Canada	42	2
China	0	1
Germany	7	0
Hong Kong	1	0
Israel	1	1
Italy	3	0
Japan	3	0
Mexico	4	0
Monaco	1	0
Netherlands	2	0
New Zealand	2	0
Norway	1	0
Portugal	4	0
Singapore	1	0
Spain	3	1
Thailand	3	1
United Arab Emirates	1	0
United Kingdom	24	2
TOTAL	114	11

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MEETINGS

ABOUT THE ALCOR FOUNDATION

The Alcor Life Extension Foundation is a nonprofit tax-exempt scientific and educational organization dedicated to advancing the science of cryopreservation and promoting cryonics as a rational option. Being an Alcor member means knowing that—should the worst happen—Alcor's Emergency Response Team is ready to respond for you, 24 hours a day, 365 days a year.

Alcor's Emergency Response capability includes specially trained technicians and customized equipment in Arizona, northern California, southern California, and south Florida, as well as many additional certified technicians on-call around the United States. Alcor's Arizona facility includes a full-time staff, and the Patient Care Bay is personally monitored 24 hours a day.

ARIZONA

FLAGSTAFF:

Arizona without the inferno. Cryonics group in beautiful, high-altitude Flagstaff. Two-hour drive to Alcor. Contact eric@flagstaffcryo.com for more information.

PHOENIX
VALLEY OF THE SUN:

This group meets monthly, usually in the third week of the month. Dates are determined by the activity or event planned. For more information or to RSVP, visit http://cryonics.meetup.com/45/ or email Lisa Shock at lisa@alcor.org.

AT ALCOR:

Alcor Board of Directors Meetings and Facility Tours—Alcor business meetings are generally held on the first Saturday of every month starting at 11:00 AM MST. Guests are welcome to attend the fully-public board meetings. Facility tours are held every Tuesday at 10:00 AM and Friday at 2:00 PM. For more information or to schedule a tour, call Marji Klima at (877) 462-5267 x101 or email marji@alcor.org.

CALIFORNIA
LOS ANGELES:

Alcor Southern California Meetings—For information, call Peter Voss at (310) 822-4533 or e-mail him at peter@optimal.org. Although monthly meetings are not held regularly, you can meet Los Angeles Alcor members by contacting Peter.

SAN FRANCISCO BAY:

Alcor Northern California Meetings are held quarterly in January, April, July, and October. A CryoFeast is held once a year. For information on Northern California meetings, call Mark Galeck at (650) 969-1671, (650) 534-6409 or email Mark_galeck@pacbell.net.

FLORIDA

Central Florida Life Extension group meets once a month in the Tampa Bay area (Tampa and St. Petersburg) for discussion and socializing. The group has been active since 2007. Email arcturus12453@yahoo.com for more information.

NEW ENGLAND
CAMBRIDGE:

The New England regional group strives to meet monthly in Cambridge, MA—for information or to be added to the Alcor NE mailing list, please contact Bret Kulakovich at 617-824-8982, alcor@bonfireproductions.com, or on FACEBOOK via the Cryonics Special Interest Group.

PACIFIC NORTHWEST

A Yahoo mailing list is also maintained for cryonicists in the Pacific Northwest at http://tech.groups.yahoo.com/group/CryonicsNW/.

BRITISH COLUMBIA (CANADA):

The contact person for meetings in the Vancouver area is Keegan Macintosh: keegan.macintosh@me.com.

OREGON:

The contact person for meetings in the Portland area is Aschwin de Wolf: aschwin@alcor.org. See also: https://www.facebook.com/portland.life.extension

ALCOR PORTUGAL

Alcor Portugal is working to have good stabilization and transport capabilities. The group meets every Saturday for two hours. For information about meetings, contact Nuno Martins at n-martins@n-martins.com. The Alcor Portugal website is: www.alcorportugal.com.

TEXAS
DALLAS:

North Texas Cryonauts, please sign up for our announcements list for meetings (http://groups.yahoo.com/group/cryonauts-announce) or contact David Wallace Croft at (214) 636-3790 for details of upcoming meetings.

AUSTIN/CENTRAL TEXAS:

A new group for the Austin area has been started for those interested in discussion and understanding of the relevant technologies and issues for cryopreservation, genomics, epigenetics and medical research for increased life/health span. Contact Tom Miller, 760-803-4107 or tom@blackmagicmissileworks.com.

JAPAN

Cryonics meetings are held monthly in Tokyo. Send queries to grand88(at)yahoo.com.

UNITED KINGDOM

Alcor members in the UK can contact Garret Smyth at Alcor-UK@alcor.org for information about local meetings.

If you are interested in hosting regular meetings in your area, contact Alcor at 877-462-5267, ext. 113. Meetings are a great way to learn about cryonics, meet others with similar interests, and introduce your friends and family to Alcor members!

What is Cryonics?

Cryonics is an attempt to preserve and protect human life, not reverse death. It is the practice of using extreme cold to attempt to preserve the life of a person who can no longer be supported by today's medicine. Will future medicine, including mature nanotechnology, have the ability to heal at the cellular and molecular levels? Can cryonics successfully carry the cryopreserved person forward through time, for however many decades or centuries might be necessary, until the cryopreservation process can be reversed and the person restored to full health? While cryonics may sound like science fiction, there is a basis for it in real science. The complete scientific story of cryonics is seldom told in media reports, leaving cryonics widely misunderstood. We invite you to reach your own conclusions.

How do I find out more?

The Alcor Life Extension Foundation is the world leader in cryonics research and technology. Alcor is a non-profit organization located in Scottsdale, Arizona, founded in 1972. Our website is one of the best sources of detailed introductory information about Alcor and cryopreservation (www.alcor.org). We also invite you to request our FREE information package on the "Free Information" section of our website. It includes:

- A fully illustrated color brochure
- A sample of our magazine
- An application for membership and brochure explaining how to join
- And more!

Your free package should arrive in 1-2 weeks. (The complete package will be sent free in the U.S., Canada, and the United Kingdom.)

How do I enroll?

Signing up for a cryopreservation is easy!

Step 1: Fill out an application and submit it with your $90 application fee.
Step 2: You will then be sent a set of contracts to review and sign.
Step 3: Fund your cryopreservation. While most people use life insurance to fund their cryopreservation, other forms of prepayment are also accepted. Alcor's Membership Coordinator can provide you with a list of insurance agents familiar with satisfying Alcor's current funding requirements.
Finally: After enrolling, you will wear emergency alert tags or carry a special card in your wallet. This is your confirmation that Alcor will respond immediately to an emergency call on your behalf.

Not ready to make full arrangements for cryopreservation? Then **become an Associate Member** for $5/month (or $15/quarter or $60 annually). Associate Members will receive:

- *Cryonics* magazine by mail
- Discounts on Alcor conferences
- Access to post in the Alcor Member Forums
- A dollar-for-dollar credit toward full membership sign-up fees for any dues paid for Associate Membership

To become an Associate Member send a check or money order ($5/month or $15/quarter or $60 annually) to Alcor Life Extension Foundation, 7895 E. Acoma Dr., Suite 110, Scottsdale, Arizona 85260, or call Marji Klima at (480) 905-1906 ext. 101 with your credit card information. You can also pay using PayPal (and get the Declaration of Intent to Be Cryopreserved) here: http://www.alcor.org/BecomeMember/associate.html

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