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Alcor's 50th Anniversary Business Model Relaunch

page 5

How to Optimize Your Chances of a Good Cryopreservation

page 22

Notable Women in Cryonics

page 28

ALCOR
ALCOR LIFE EXTENSION FOUNDATION
The World's Leader in Cryonics

CRYONICS

Contents

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cryonics-magazine-archive

5 Alcor's 50th Anniversary Business Model Relaunch
On its 50th Anniversary, Alcor President and CEO Patrick Harris announces some major changes to make signing up easier, to join Alcor with a full range of benefits without making cryonics arrangements yet, and a new program to educate the public and increase membership growth.

16 Art Quaife Letter and CEO Appreciation Letter
Long-time cryonics supporter and Alcor member Art Quaife has made a substantial financial donation to Alcor and we are extremely grateful to announce this.

22 How to Optimize Your Chances of a Good Cryopreservation
You have executed all your cryonics paperwork, but do you know that there are many other important things you must do to optimize the chances of good cryopreservation?

28 Notable Women in Cryonics
Meet some notable women in cryonics: Linda Chamberlain, Carol Shaw, Natasha Vita-More, Carrie Radomski, Allison Duettmann, and the writer herself!

32 An Institutional History of Alcor
In this article, Mike Perry takes us through the history of Alcor as an organization. Where was it founded, how has it evolved, which events triggered legal and institutional changes?

44 Fight Aging!
Reports from the front line in the fight against aging.

53 Membership Statistics
How many members, associate members, and patients does Alcor have and where do they live?

Editorial: Alcor's 50th Anniversary

By Aschwin de Wolf

I still remember frantically (but cautiously) reading cryonics literature during the summer of 2002. It was quite persuasive to me, but there were two reasons I held off for a little bit in sending in my own application for membership. On November 16-17 Alcor was celebrating its 30th anniversary in Newport Beach, California. This "Fifth Alcor Conference on Extreme Life Extension" was a good opportunity to meet cryonics researchers, thought leaders, and members in person to see if this was a credible community (it was), but also to have the application fee waived for people who applied for membership at the conference. As Alcor prepares for its 50th Anniversary conference in June 2022, it's time for a recap.

When I signed up for cryonics in 2002 there was no online application process that took care of most paperwork processing. Executing all the paperwork by hand was a non-trivial exercise. When you read this Editorial, I am glad to announce that Alcor has made the daunting task of signing up a little easier by streamlining this process online.

In 2002 there was no option to join Alcor as a member without making cryonics arrangements. As much as I wanted to make cryonics arrangements, this always struck me as strange. There are many people who would like to support the mission of Alcor without making cryonics arrangements themselves. It would also stand to reason that a tax-exempt non-profit would benefit from an option that allows people to join who support its mission. In 2012 this wish turned into reality when I successfully persuaded the Board of Directors to introduce a new type of Associate Membership that allowed people to join the organization without making cryonics arrangements. I am greatly pleased to announce here that Alcor decided to further build along those lines and introduce an even more robust type of membership for people who are not ready to make cryonics arrangements (yet). Unlike the old Associate Membership program, this new type of membership allows people to fully take advantage of benefits that are now available to funded members such as the ability to lock in age-based dues and being able to cryopreserve their companion animals.

Alcor needs membership growth, provided its members are well informed and there is true consent. One attractive feature of Alcor's new ICE program is that it aligns incentives with education. I feel confident that good education will translate into rapid membership growth. In my personal experience, hostility and uncharitable skepticism can change to a more neutral or supportive stance when people are encouraged to fully investigate the technical nuances of the cryonics proposition.

I am optimistic about the future of Alcor and cryonics for the next 50 years. When I attended the Alcor conference in 2002, nanomedicine pioneer Robert Freitas launched into a compelling presentation titled "Death is an Outrage!" In this lecture he argued how a mature nanomedicine could "eliminate 99 percent of all medically preventable conditions that lead to natural death." I had always hoped that Robert would apply his broad technical knowledge and rigor to the revival of cryopreserved patients. As Alcor celebrates its 50th anniversary, I am proud to announce the publication of his groundbreaking massive technical work "Cryostasis Revival: The Recovery of Cryonics Patients through Nanomedicine." This work is the most ambitious technical exposition of how to restore an Alcor patient to good health ever written and will force critics to engage with the conceptual underpinnings of cryonics and its technical feasibility on specific scientific terms. It will also spur a great number of distinct research projects to develop and refine revival technologies.

In 1962 Robert Ettinger introduced the world to the idea of cryonics in his seminal book "The Prospect of Immortality." In 1972 Fred and Linda Chamberlain put the delivery of cryonics services on a technically and financially sound path by creating the Alcor Life Extension Foundation. Fifty years later we offer you a detailed proposal on how to revive our patients. ■

A word from Alcor's Co-Founder, Linda Chamberlain

Looking Back

I feel like a proud grandmother when I look at Alcor today and I marvel at the strength and integrity of this organization. That is important to me not only because I have been part of Alcor for 50 years, but also because it is the child I shared with Fred Chamberlain III, the other co-founder, and my treasured husband. It is also important because Alcor cares for three of my family members and will someday be my own safety net.

As I look back to the incorporation of Alcor 50 years ago, and the struggle to build this organization, I am reminded of the many challenges and dark periods that Alcor has survived. I have sometimes thought of Alcor as a 50-year start-up. By any normal business model, Alcor would have gone bankrupt and out of business many times over. But Alcor is not a normal business, and it has not been run by normal people.

Alcor has been fortunate to have been managed over the decades by different, but always exceptional, people who had the ability to see the Alcor vision and fight to preserve and enhance its mission. Every challenge was unique, but somehow Alcor always managed to find a champion who was uniquely capable of overcoming those challenges and bringing Alcor new heights of strength and perseverance.

It has been my great honor to work personally with many of the very special people who have given so generously of their talent, their time, and their money, over the decades. I would like to name those heroes, every one of them, but this would turn into a book instead of a short article. One of the greatest bonuses of my life is to have had the privilege of helping family members, friends and many Alcor members that I did not know personally, by participating in their journeys to the future.

Looking Forward

I have never been prouder of Alcor or more excited about its future than I am today. The current Board of Directors is technologically and professionally diversified, talented, and matchlessly dedicated to moving Alcor forward. Alcor's current CEO is bringing to Alcor a corporate maturity that it has not previously had the skills or tools to make that development possible. The Alcor staff are all exceptionally talented and dedicated, and the growing Alcor membership is increasingly made up of people that are inspiring visionaries.

This 50th Anniversary issue of *Cryonics* magazine is packed with details about Alcor's new business model, designed to grow the membership numbers beyond anything possible before, which will give Alcor more revenue to put toward our mission. What's in it for *you* will inspire and impress you, as it did me! Be sure to check out the streamlined online sign-up system, the improved and even more beneficial Permanent Prepay program, the new membership classifications, the powerful new age-based dues structure that will benefit existing members as well as new members, and the launch of the Independent Cryonics Educator (ICE) Program to not only help Alcor educate the public about cryonics, but also make money for everyone who participates!

Happy 50th Birthday, Alcor!

Linda Chamberlain

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Alcor's 50th Anniversary
Business Model Relaunch

Alcor was incorporated as a nonprofit, federally tax-exempt, 501(c)(3) corporation on February 23, 1972, for **educational** and **scientific** purposes. Today, February 23, 2022, is **Alcor's 50th Anniversary**! To mark this historic event, Alcor is relaunching our business model.

Alcor's mission statement is, "*To save lives through the following prioritized principles:*

1. *Maintain the current patients in biostasis.*
2. *Place current and future members into biostasis (when and if needed).*
3. *Eventually restore to health and reintegrate into society all patients in Alcor's care.*
4. *Fund research into developing more cost effective and reliable means for 1-3 above.*
5. *Provide public education as a means of fostering growth to support the goals of 1, 2, 3, 4 above."*

While Alcor is organized for educational and scientific purposes, membership growth is required to support Alcor's nonprofit mission. Alcor's longstanding mission is being implemented and fulfilled by, among other things, three (3) strategic pillars; ***Growth, Research, and Education***.

Investing in the Research strategic pillar leads to discoveries and innovations, supporting our Education strategic pillar. Investing in the Education strategic pillar raises public awareness and acceptance of cryonics, supporting our Growth strategic pillar. Investing in the Growth strategic pillar increases fiscal resources and allows us to hire and retain high caliber people, supporting our Research strategic pillar. These strategic pillars are the basic formula to accomplish Alcor's mission.

Alcor's new business model is designed to support ***Growth*** and advance our ***Research*** and ***Education*** pillars. We are excited to announce the enhancements to Alcor's business model.

Respectfully,

Patrick Harris, *Alcor's President & CEO;*
Linda Chamberlain, *Alcor's Co-Founder;*
Alcor's Leadership Team & Staff;
Lisa Harris, *Legal & Regulatory Committee & Advisor to the Board;*
Alcor's Board of Directors

Enhanced Agreements & Online Signup

Membership agreements have been completely updated to better protect our Members, Patients, and Alcor. Existing and new Members can now signup or update their contracts online.

Alcor's Historical Challenges – Agreements and Online Signup

Alcor's old agreements require the signatures of a notary and two witnesses. Previously, notary and witness signatures prevented Alcor from offering online signup. This process creates an unnecessary burden on new Members.

Alcor has made many revisions to its agreements over the last 50 years. Alcor last made changes in 2012, but it was not a complete contract rewrite. There are currently 25 different versions of active membership agreements, each having legal nuances that must be considered during a case deployment and any of which can complicate or delay cryopreservation.

Alcor has never shied away from litigation because we believe that protecting our Members' and Patients' interests is sacrosanct. Prior agreements needed to be consolidated and rewritten entirely to better protect our Members from interference, our Patients from third-party risks, and Alcor from existential threats, all of which serve to strengthen the cryonics industry.

Alcor's New Model – Agreements and Online Signup

Alcor's new agreements have clearly written, unified, provisions. They are e-signable via DocuSign and support the other components of our enhanced business model. The new contracts offer greater protections for members, patients, Alcor, and the cryonics industry. Additionally, existing members will benefit from the ease of use of the online platform when updating or making elective changes to their Alcor agreement.

The online signup process for new Members will require minimal information to lock in a dues basis and establish membership and may be completed within minutes. There are safeguards built in to ensure against errors, such as requiring that a Member's Date of Birth (DOB) be entered twice before e-signing an agreement.

Alcor encourages existing membership to experience the streamlined online signup process and lock in their dues basis by visiting Alcor's website, www.Alcor.org.

Permanent Prepay

The option to prepay for membership and cryopreservation has been enhanced with the added benefit of having your prepaid cryopreservation cost grandfathered in, even in the event of changes to our standard cryopreservation fees. Your dues, *which may be tax-deductible*, and cryopreservation cost will never increase.

Alcor's Historical Challenges – Permanent Prepay

Alcor once offered a prepay option for membership dues that a small number of people took advantage of before Alcor eliminated the opportunity due to a structural issue with holding the prepaid funds in Alcor's operating account. Alcor's current business model for Member dues and the cost of cryopreservation does not protect against rising costs. For example, in 1981, the cost of Neuro-preservation was $25,000, and Whole-Body was $60,000. The current cost for Neuro and Whole-Body in 2022 are $80,000 and $200,000, respectively, before CMS charges, and both include coverage of standby services. Costs naturally increase over time due to inflation.

Based on decades of data, Alcor determined many people do not consider the rising cost of cryopreservation over the decades when they become a Cryopreservation Member. Notably, nearly a decade ago, Alcor created the Underfunding Reserve Account (aka "the Underfunding Plan") for Members who joined Alcor before May 2013. The Underfunding Plan introduced additional fees to underfunded Members when cryopreservation costs increased.

Alcor's NEW Model – Permanent Prepay

Alcor's enhanced model will offer two prepayment options to protect members against rising costs. The first option is for members to prepay their membership dues for life once, becoming a Lifetime Member. The second option is for members to prepay both their membership dues and the cost of cryopreservation once, becoming a Lifetime Cryopreservation Member. Dues may be tax-deductible, and Alcor encourages you to speak with a tax professional.

A Lifetime Member may permanently prepay dues, secure lifetime membership, and never pay dues again. A Lifetime Cryopreservation Member may permanently prepay the cost of cryopreservation and dues, and their dues and cryopreservation obligation will never increase.

When a Lifetime Member or Lifetime Cryopreservation Member prepays, Alcor will send the prepayment to a separate legal entity to professionally manage the funds. The separate legal entity will pay Alcor annual dues on behalf of each prepaid member and continue investing the remaining balance. For prepayment by Lifetime Cryopreservation Members, the entity will use the prepaid funds to pay the associated cryopreservation costs at the time of legal death. Alcor elected to use a separate entity instead of Alcor's operating account for these two new Permanent Prepay options to better protect the funds from various risks that may be present in the future.

Alcor worked with three experienced, licensed actuaries to develop models supporting these prepayment options. Prepayments are calculated individually based on actuarial tables in the same way life insurance providers calculate premiums. Prepayments for Lifetime Members and Lifetime Cryopreservation Members are based on the current cost of cryopreservation and/or dues in light of the actuarial tables. Please get in touch with Alcor to get a quote for our Permanent Prepaid options.

New Member Option

You can now be an Alcor Member *without* cryopreservation funding.

Alcor's Historical Challenges – New Members

Throughout Alcor's 50-year history, anyone who wanted to become an Alcor member was required to secure and provide evidence of cryopreservation funding before becoming a member. Other Cryonics Service Providers (CSOs), such as the Cryonics Institute, do not require proof of cryopreservation funding before becoming a member of the CSO. Requiring verification of cryopreservation funding created disincentives and barriers to signing up as a Member. The most popular option for cryopreservation funding is securing a life insurance policy. Finding the right policy can be time-consuming and difficult to budget for at different life stages.

Alcor determined that some people want to become members but are not ready or able to secure funding for cryopreservation, but want to become an Alcor member today. For example, a college student may be able to afford Alcor dues, but not the cost of life insurance. Many similarly situated people have expressed interest in securing funding later, possibly years or decades later, but want to complete their Alcor member agreements now. Other people have been excluded from being an Alcor Member due to the cryopreservation funding requirement, including mission supporters who do not want to be cryopreserved. Several individuals have expressed that they wish to be members, or gift membership to someone, to support Alcor's mission, but they may not personally desire to be cryopreserved. This group wants Alcor to succeed at our mission and stay informed about our progress without necessarily becoming an Alcor patient.

Alcor's New Model – New Members

You can now become an Alcor Member without providing proof of cryopreservation funding! Alcor's definition of "Member" is anyone who signs a membership agreement and pays dues. A member who elects to secure funding and signs a cryopreservation agreement is defined as a "Cryopreservation Member."

Alcor's online signup process reduces the paperwork and snail-mail burden, allows someone to join before securing cryopreservation funding, and opens Alcor membership to people who are undecided if they want to be cryopreserved at legal death but wish to support the mission and stay informed. Current benefits for Alcor Members include the following:

- Alcor Newsletters and special announcements;
- A subscription to *Cryonics* magazine;
- Free copy of a model *Alcor Revival Trust* upon request;
- Discounts to conferences;
- Locked-in **Age-Based Dues** basis to save money over the long-term;
- Greater discounts when a Member, who is an Independent Cryonics Educator**,** shares an ICE Code;
- The option to sign a cryopreservation agreement and become a Cryopreservation Member; and
- The opportunity to sign a pet cryopreservation agreement to cryopreserve a companion animal.

Alcor is excited that our new business model opens membership up to various groups who previously could not become Alcor Members. As more Members join and become further educated about our mission, some Members may later decide to become Cryopreservation Members!

Age-Based Dues Structure

It is well-known that one of the greatest ailments suffered by cryonicists is Cryocrastination. Now there is an economic incentive to sign up sooner and remain a Member for life.

Alcor's Historical Challenges – Dues

For decades Alcor, as a nonprofit, has charged annual dues. Alcor's agreements have always allowed Alcor to adjust annual dues at Alcor's discretion to account for costs and inflation. Inflation naturally occurs over time. Non-discounted dues in 1981 were $85 per year, whereas, in 2021, they were $660 per year. Alcor offered discounts on dues for specific membership categories, such as additional family members, college students, and members in good standing consecutively for decades.

Alcor's dues structure previously required everyone to pay the current dues regardless of age when they signed up for membership. Dues could also be changed at Alcor's discretion. Long-term member discounts did not take effect until at least 20 years of consecutive membership.

Charging younger members in their 20s, such as newly graduated college students, the same rate for someone who decided to wait and become an Alcor member in their 50s created an economic disincentive for people to become an Alcor member earlier. Why pay membership dues if you may not be cryopreserved anytime soon?

Long-term members (20+ years) on a fixed income due to retirement currently pay ~ 20% less for dues than everyone else does, despite their income. A ~ 20% discount on annual dues is a trivial economic benefit after paying full dues for decades. Further, internal monitoring, managing, and crediting discounts on dues for specific categories has increased Alcor's operating cost. For example, Alcor did not know when to apply a student discount unless a member told Alcor they were students.

Alcor's New Model – Dues

Alcor's new structure will utilize "Age-Based Dues." Alcor has worked with life insurance providers for decades, and we are taking a page out of their successful playbook. When signing up for life insurance, annual premiums cost less the younger someone is when the policy is established.

Alcor's new Age-Based Dues will be determined when someone first becomes a member. The Age-Based Dues schedule for 2022 is:

- **$60 per minor child** under 18 years old;
- ***$200 for 18-year-olds*** signing a new membership agreement;
- ***Current Age x Annual Dues Multiplier ($15 currently)*** for new or existing members who sign a new membership agreement.
    - *Example: If a member signs up when they are 30 years old, their Age-Based Dues will be $450. (30 years old * $15 Annual Dues Multiplier).*
- (Existing Members who sign an updated agreement will be grandfathered in and lock in the current dues *basis*.)

Age-Based Dues mean just that. Whatever dues correspond to the age at which a Member signs up will be the dues the Member pays throughout their life, provided the Member pays dues timely and per the member's agreement.

Alcor is modeling our Age-Based Dues after the life insurance industry to eliminate the perverse economic incentive of "cryo-crastination." The Annual Dues Multiplier will be evaluated annually by Alcor's Board and Executive Leadership. In 2022 the Annual Dues Multiplier is $15, multiplied by a Member's age when signing our new agreement. At the end of FY2022 and every year after that, the Alcor Board and Executive Leadership will determine if, and by how much, the Annual Dues Multiplier will increase. For example, if Alcor increases the Annual Dues Multiplier to $20 for 2023, all new members signing an agreement in 2023 will lock in a dues *basis* equal to their then-current age x $20. An illustration of Alcor's new Age-Based Dues follows:

> *Suzy and John are 18 years old and decide they want to be Alcor Members in 2022. Suzy signs up before her 19th birthday and locks in a dues basis at $200. Provided there are no increases to locked in Age-Based Dues when Suzy is 50 years old, she will enjoy continuing to pay only $200 per year in membership dues during the calendar year 2053.*
>
> *On the other hand, John decided to wait until he was 50 years old to become an Alcor Member in 2053. For 32 years, while John waited to become a member, Alcor needed to increase the Annual Dues Multiplier several times to cover inflation and costs. The 2053 Annual Dues Multiplier is $68, and John's Age-Based Dues when he signs up at age 50 in 2053 is $3,400.*
>
> *In the calendar year 2054, John pays another year of dues at $3,400 for a total of $6,800 for two (2) years of membership. On the other hand, Susy paid $200 per year for 33 years for a total of $6,600 in dues over her life up to that point. By locking in her Age-Based Dues basis early, Suzy enjoys significantly lower dues than John as she prepares to retire from her job early and go on a fixed income.*

Age-Based Dues FAQs:

Will Alcor require evidence of Date of Birth (DOB) with the new Age-Based Dues structure?

- For Members, Alcor will not require evidence, such as a photocopy of a government-issued ID. However, evidence to confirm DOB will be needed for Cryopreservation Members. A Member may sign a new agreement today without providing evidence to validate their DOB. If a Member later decides to become a Cryopreservation Member, then Alcor will ask for proof of their DOB to ensure Age-Based Dues are calculated correctly.

How much will the Annual Dues Multiplier go up every year?

- Alcor's Board of Directors and Executive Leadership will review operating costs, program costs, strategic initiatives, and inflationary pressures to determine the Annual Dues Multiplier on an annual basis. While Age-Based Dues will increase over time, the younger a Member is when they sign up, the lower the Annual Dues Multiplier they will benefit from. This will lead to significant savings the earlier someone becomes an Alcor Member.

*Can Alcor **increase** dues for Members who locked in Age-Based Dues basis in the future?*

- Yes, this is *possible* for non-Permanent Prepay Members; Alcor can and has increased dues in the past under the previous model and agreement. A provision in *all* Alcor agreements, including the new agreement, allows Alcor to adjust dues. Over decades, the likelihood of hyperinflation is high. For example, suppose during a period of hyperinflation, Alcor is required to increase all dues by 10%. In that case, a Member who locked in $200 per year dues *base* will then pay $220 per year but will save $40 over a Member who locked in $600 per year dues base when that member's 10% increase equates to a new dues amount of $660, and the member paying $220 will still have the benefit of lower Age-Based dues amount. By the end of FY2021, Alcor only had 1397 Members. Alcor's aims to minimize the potential of increasing dues for Members in the future by growing our Membership and resulting in overall dues revenue increases.

I am a current member with a long-term discount. Can I lock in my current dues if I sign a new agreement?

- Yes. As a loyal Member in good standing who is current on your dues, you can lock in your current dues *basis*. For example, if you are 60 years old and have a 20-year member discount, you are currently paying $540 per year in dues. Instead of signing a new agreement at $900 per year in dues (age 60 * $15 *Annual Dues Multiplier*), Alcor will grandfather your current $540 per year dues, provided you sign an updated agreement during the calendar year 2022.

Will Alcor continue to offer discounts for members with Age-Based Dues?

- Existing discounts will be grandfathered if a current Member signs a new agreement in the calendar year 2022; however, discounts will not be offered with Age-Based Dues. The new dues structure incorporates lower dues for students and saves students more money each year they remain a Member. For example, if Suzy signs up when she is 18 years old and pays $200 in dues, she pays less than the previous student discount. Additionally, as Suzy gets older and time passes, her $200 in dues will be less financially burdensome years or decades from now due to inflation and increased wages.

I already have an agreement with Alcor and pay annual dues. Why should I sign a new agreement?

- Alcor's old agreements do not support Age-Based Dues, whereas our new agreements lock in a *base* dues rate. You may continue operating under your old agreement, and Alcor will continue to make annual decisions on how much dues will be each year for Members with older contracts. For example, if you are currently paying $660 / year in dues and Alcor decides to increase dues to $750 in 2023, your dues will increase to $750 / year, and you will not benefit from the Age-Based Dues basis.

Are Age-Based Dues tax-deductible?

- Alcor is a federally tax-exempt, 501(c)(3) corporation, and your dues may be tax-deductible. Any time you want to review Alcor's tax status, you can visit the IRS's website at https://apps.irs.gov/app/eos/ and enter our EIN 23-7154039. Dues and donations may be tax-deductible if they are made before the close of the tax year. Alcor cannot give tax advice, so we encourage you to speak with a tax professional regarding your dues and taxable income.

Independent Cryonics Educator (ICE) Program

To fulfill Alcor's mission of Education, Alcor is launching the Independent Cryonics Educator (ICE) Program, which provides compensation for those who participate in the program and refer new Members, and provides discounts to referred new Members.

Welcome to the Launch!

Alcor Life Extension Foundation is pleased to announce a new self-funded educational program, the Independent Cryonics Educator (ICE) Program! One of the most significant challenges the cryonics industry has faced over the decades is raising awareness of cryonics with the public. The ICE Program is designed with economic incentives to educate the public and advance Alcor's nonprofit mission.

The ICE Program will allow **anyone** to refer prospective members to a cryonics organization, such as Alcor, whether they are an Alcor member, a member of another CSO, or not a member at all. Cryonics enthusiasts, cryo-crastinators, members of other cryonics organizations, Alcor Members, and any other person interested in educating the public about cryonics may participate in the ICE Program.

Alcor will issue an **ICE Code** to anyone participating in the ICE Program. The ICE Code is an identifying code *unique* to each Independent Cryonics Educator (ICE) and will serve two purposes. First, the ICE Code will identify which ICE will **receive compensation** and how much from referrals for new members. Second, the ICE Code will determine the **discount** level applied to a new member's first-year dues. The following compensation schedule for Independent Cryonics Educators and discounts available for new members has been approved by Alcor's Board of Directors for the calendar year 2022.

Independent Cryonics Educator (ICE) Type	New Member Discount	ICE Compensation
Referrals by ICE for New Members of Alcor		
***Non*-Alcor Member**	**10%** Off First-Year *Alcor* Dues	**50%** of New Member's First-Year Dues paid by Alcor to ICE.
Alcor *Member*	**25%** Off First-Year *Alcor* Dues	
Alcor *Cryopreservation* Member	**50%** Off First-Year *Alcor* Dues	
***Referrals by ICE for New Members of another CSO**		
TBA	TBA	TBA

**Alcor contacted the presidents of other Cryonics Service Organizations (CSOs) and invited them to participate in the ICE Program. Compensation to ICEs and discounts for new members will be decided by each CSO collaborating with Alcor on the ICE Program to educate the public.*

Future changes, if any, to compensation and discounts for the program will be available on Alcor's website, www.Alcor.org.

Becoming an Independent Cryonics Educator (ICE) costs nothing, is easy, and anyone can join the program. Simply sign the ICE agreement, fill out a W-9 so Alcor can pay you, and start educating the public about cryonics and sharing your ICE Code. Alcor will generate a unique ICE Code for each Independent Cryonics

Educator to share with potential new members. When a potential member uses an ICE Code, they will receive the associated discount off their first-year's Age-Based Dues. The Independent Cryonics Educator will be paid for referring new member(s)!

ICE Code Discounts:

***Non-Alcor Members*:** Anyone can be an Independent Cryonics Educator (ICE) without being an Alcor Member. When an ICE Code is used from a Non-Alcor Member, a **10% discount** off first-year dues for new Alcor Members will be applied.

Alcor Members: Alcor Members intuitively know more about cryonics and Alcor, minimally, because they have signed up. Alcor Members are better positioned to educate prospective members than non-Alcor Members. Improved education on the front end reduces Alcor's costs, aligns with Alcor's mission, and is worth a more significant discount than for non-Alcor Members. Therefore, a **25% discount** off first-year dues for new Alcor Members will be applied when using a code from an Alcor Member.

Alcor Cryopreservation Members: This group of Alcor Members has completed all paperwork for informed consent, completed the process of fully funding their cryopreservation, and has a vested interest in Alcor's success. Cryopreservation Members are best equipped to educate the public, which reduces Alcor's costs associated with educating the public and furthers Alcor's mission. Therefore, a **50% discount** off first-year dues for new Alcor Members will be applied when using a code from an *Alcor Cryopreservation Member*.

Compensation for ICE:

Educating the public about cryonics and options available from various CSOs takes time, and Alcor appreciates your time is worth money. Instead of paying for external marketing conceived by people with little to no knowledge of cryonics, Alcor decided to offer compensation to *anyone* who helps further our growth efforts and mission.

Anyone participating in the ICE Program will receive payment from Alcor for new Alcor Members when their ICE Code is used. When an ICE gives a prospective member an ICE Code, and it is used during signup, **Alcor will pay 50% of the first-year dues** to the ICE based on the unique code used. As an example:

> *Ms. Taylor does not want to be an Alcor Member, but she wants to support Alcor's mission and signup for the ICE Program. Ms. Taylor has 5M followers on social media, and she spends some time educating her followers about cryonics. The average age of Ms. Taylor's followers is 30 years old, and their average Age-Based Dues is $450 (30 yo x $15). Assuming 1% of Ms. Taylor's followers use her ICE Code, and the average age of new Members is 30 years old,* ***Alcor will pay Ms. Taylor $11,250,000*** *(5M x 1% x $450 x 50%).*

ICE Program FAQs:

*The ICE Program **pays** people to educate and refer new members. Is this legal?*

- Yes. Alcor worked with expert tax counsel and general counsel during the strategic development of the ICE Program. The ICE Program aligns with Alcor's tax-exempt educational and scientific purposes.

Why did Alcor launch the ICE Program instead of simply paying an advertising firm?

- As a charitable organization, Alcor wants to allow the public to be paid for their educational efforts instead of paying a big firm. Alcor also intends to capitalize on the knowledge and passion our cryonics community members have and are capable of sharing with others. Alcor hopes many people will succeed as Independent Cryonics Educators and earn additional income by educating the public about cryonics.

My CSO is not participating in the ICE Program. How can I get them to participate?

- Contact your CSO and ask them to reach out to Alcor.
- Remember, even if your CSO is not participating directly in Alcor's ICE program, you can still be an ICE and receive compensation for referring new members to participating CSOs.

Why shouldn't my CSO launch their own ICE Program instead of collaborating with Alcor?

- Alcor believes reputable CSOs want the public to be educated about cryonics, not just their specific organization. Launching a look-alike program will require educators to sign another agreement, work with different materials for each CSO, keep track of other "codes" specific to each CSO, etc. Further, each ICE Program look-alike will have an administrative overhead, increasing the costs for a CSO. Alcor believes reputable CSOs will benefit from a unified effort of consistently educating the public about cryonics, and ICEs will benefit from one ICE Code that works for multiple CSOs.

I am a member of a different Cryonics Service Organization (CSO). Can I join the ICE Program, educate the public, and get paid?

- Anyone can join the ICE Program and educate the public about cryonics, including members of other CSOs. Payment for education and referrals depends on if the new member joined a CSO participating in the ICE Program.

How will Alcor know how much to pay me for my time educating and referring new members?

- When a prospective member joins a participating CSO, your unique ICE Code will track the compensation you earn. Each CSO, such as Cryonics Institute, Tomorrow Biostasis, Southern Cryonics, etc., will independently decide if they want to participate in the ICE Program and the discounts and compensation they will support. Alcor will cover the cost of the ICE Program (accounting, legal, etc.), and other reputable CSOs are welcome to participate *free* of charge.

Is there a limit on how much I can make as an ICE?

- No. Each participating CSO will determine their compensation schedule. Alcor will pay 50% of first-year dues to ICEs referring new Members, up to a limit *per* new Member. Alcor recognizes our new Age-Based Dues may create perverse incentives to sign up older people because their first-year dues will be more than a younger Member. Alcor will cap each referred new Member's compensation to an ICE at no greater than 50 years old. For example, if a new Member is 55 years old, the ICE compensation will be based on a 50-year old's Age-Based Dues. In this example, 50 years old * $15 * 50% first-year dues = $375 for referring a member 50+ years old. There will be **NO limit** on total compensation for multiple members, as illustrated in the example of Ms. Taylor above.

I referred someone who became an Alcor Cryopreservation Member, not just an Alcor Member. Do I make more from my referral of a Cryopreservation Member?

- No. Compensation under the ICE Program for new Alcor Members is based on educating the public about cryonics, **not** "selling cryopreservation." You will receive 50% of the first-year Age-Based Dues calculated for the Cryopreservation Member, same as if they only signed up to be an Alcor Member.

Ok, I am ready to sign up for the ICE Program. Does Alcor have materials to help me educate the public?

- Alcor's Ambassador & President Emeritus, Max More, will be the primary point of contact for the ICE Program for the calendar year 2022. Max authored some starting educational materials for Independent Cryonics Educators (ICE) to assist their efforts to educate the public. ICEs are welcome to create their materials, such as videos, and we encourage ICEs and other CSOs to submit materials to Alcor so other ICEs can successfully educate the public. Alcor plans to release more materials to ICEs as they become available.

Letter from Art Quaife

To all friends of Alcor:

This letter confirms that I am happily donating $1,000,000.00 to Alcor as a booster to its all-important mission. The following is a brief history of my own involvement in cryonics.

When I was about four years old, my maternal grandmother died. My mother explained to me what that entailed, and told me that we all have to die someday. I was traumatized by that vision and shouted loudly "But I don't want to die!" before crying myself to sleep. From that time on I was never comfortable with the prospect of eventually becoming rotten and forgotten, and speculated on ways to avoid that end.

Then in 1963 I read a Playboy article "Intimations of Immortality" which outlined Robert Ettinger's proposal that we should begin freezing the newly dead in hopes of later revival. I was very much stricken by the article, and over that Christmas vacation I flew back to Michigan to meet Ettinger. I joined Evan Cooper's Life Extension Society in 1964, and joined the Bay Area Cryonics Society (now called the American Cryonics Society) in 1968. From 1972 thru 1998 I was the first President of Trans Time Inc., offering cryonic suspension as a commercial service.

I became an Alcor Suspension Member in 1998, and I now regularly attend the Alcor Northern California meetings. I am happy that my early cryonics colleagues Linda Chamberlain, Hugh Hixon, Ralph Merkle, Max More, and Mike Perry are still alive and working at Alcor. Saul Kent read the same 1963 Playboy article that I did, and I believe that among cryonicists still living, Saul and I are tied for the longest involvement in cryonics.

I have made several contributions to the cryonics scientific literature, including the articles listed below.

Mathematical Models of Perfusion Processes, Manrise Technical Review Vol 2 # 2-3 pp 28-75, March-June 1972.

Concentration of DMSO-Q3 Solution as a Function of Temperature and Specific Gravity, Manrise Technical Review Vol 3 #1, March 1973.

Heat Flow in the Cryonic Suspension of Humans: Survey of the General Theory, CRYONICS Vol. 6 Issue #62 pp 9-30, September 1985.

Evermore,

Art Quaife, Ph.D. (Mathematics)

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Dear Art,

I want to express my sincerest appreciation for your $1,000,000 donation to advance Alcor's mission. Your *undirected* donation supports mission-critical strategies on our roadmap that will strengthen Alcor over the coming years. We appreciate your confidence in our ability to invest your generous donation wisely.

As you disclosed in your "To all friends of Alcor" letter, I know you have been involved and contributed significantly to our mission over the years. Some of the more recent articles regarding the history of mathematics and modelling in cryonics and the development of the S-MIX (a measure to estimate the total duration of normothermic ischemia in a patient), written by *Cryonics* editor Aschwin de Wolf and Alcor's very own Mike Perry, Ph.D., have drawn from your prior writings.

After a little more than two years at Alcor, I recognize our membership knows only a tiny fraction of what we've been working on behind the scenes. Over the last couple of years, we have reshaped and improved Alcor's culture, and we now have one of the strongest and most talented teams in cryonics history.

My team and I have restructured the Alcor organizational chart and redesigned job duties to leverage the strengths of each team member. We've improved our *Standby, Stabilization, and Transport* ("SST") response capabilities, introduced the Alcor Check-In service, and we launched the *Readiness And Procedure Innovation Deployment* ("RAPID") research platform to focus our efforts on research and improve cryonics procedures. We have established committees to crowdsource innovations and improvements from the most brilliant minds to define our organizational roadmap.

Alcor has improved the working relationships with our strategic partners who support SST, and we've moved from a reactive response to proactively identifying solutions to challenges before they present. While there is still more work to improve Alcor's response capabilities, I am confident we are the gold standard that other cryonics service providers aspire to achieve.

Additionally, Alcor is managing our limited financial resources better. Costs have been reduced across the board, and the quality and quantity of deliverables have improved. After a generous donation from Life Extension Foundation in 2020, Alcor legally redomiciled from California, where Alcor was established in 1972, to Arizona, where we've been physically located since 1994. We invested in an expert legal review of Alcor's current membership agreement and rewrote our agreements to better protect our members and the patients entrusted to our care.

We have made significant transformational changes structurally, operationally, and culturally, and we've defined several new strategic initiatives. All of this, and so much more, has been accomplished in a short span of only two years as we faced seemingly insurmountable odds such as a global pandemic, riots, and turnover in critical positions at Alcor. Over the last couple of years, global turbulence destroyed many organizations and, after the most challenging business environment any of us remember, Alcor is coming out stronger than ever.

I have been working diligently with Alcor's Board and my leadership team over the last year to develop our roadmap and define our strategic plans to prepare for when Alcor is financially ready to make strategic investments. Your very generous support, Art, allows Alcor to invest in a few, but not all, of these mission-critical strategies.

As you know, Alcor's mission statement is, "*To save lives through the following prioritized principles:*

1. *Maintain the current patients in biostasis.*
2. *Place current and future members into biostasis (when and if needed).*
3. *Eventually restore to health and reintegrate into society all patients in Alcor's care.*
4. *Fund research into developing more cost effective and reliable means for 1-3 above.*
5. *Provide public education as a means of fostering growth to support the goals of 1, 2, 3, 4 above."*

Alcor's longstanding mission is being implemented and fulfilled by, among other things, three (3) strategic pillars; ***Growth, Research, and Education***. These three pillars guide Alcor's Board and my decision-making as we develop strategies, and each one supports the next.

Investing in the Research strategic pillar leads to discoveries and innovations, supporting our Education strategic pillar. Investing in the Education strategic pillar raises public awareness and acceptance of cryonics, supporting our Growth strategic pillar. Investing in the Growth strategic pillar increases fiscal resources and allows us to hire and retain high caliber people, supporting our Research strategic pillar. These strategic pillars are the basic formula to accomplish Alcor's mission.

The interaction of our strategic pillars and Alcor's current fiscal constraints begs the question, how will Alcor invest your generous donation wisely? I am excited to share the strategic initiatives *your* donation will drive forward.

Growth Pillar:

New Membership Options: Alcor will support a couple of new membership options available for both new and existing members. The first option is tailored for people who want to join Alcor but cannot afford the cryopreservation minimum today. It is designed to address the longstanding "cryo-crastination" problem. The second option will support a Permanent Prepaid Option wherein members can prepay for life. Alcor will ensure the funds are separated from operations and professionally managed to cover the cost of future cryopreservation. These Permanent Prepaid members will not need to be concerned with paying dues or the cost of cryopreservation increasing over the coming decades.

Membership Dues Basis: Alcor is restructuring our membership dues for new members and any existing members who want to take advantage of the new age-based dues in a manner that mitigates against increases in the future. The new dues basis is designed to minimize "cryo-crastination" so applicants will have an economic incentive to sign up for Alcor membership sooner and make paying dues less burdensome during retirement when our members are on a fixed income.

Membership Agreements: Legal counsel reviewed Alcor's existing membership agreements and advised us they are long overdue for a complete rewrite. We invested in expert legal counsel to accomplish this objective. Our new contracts will offer greater protections for Alcor, our members, and our patients, and are streamlined to lessen the burden applicants currently face when signing up to become a member.

Online Member Signup: We contracted with a highly recommended partner to build an online signup process for new members. Existing members wishing to take advantage of the new dues structure and enhanced agreements will have an opportunity to experience a more streamlined and more straightforward process online as well.

Research Pillar:

Enhanced CT Scanning: Alcor will upgrade our CT scans by acquiring a hospital-grade CT Scanner capable of scanning both neuro *and* whole-body patients. An upgraded scanner of this quality will require additional modifications to Alcor's building and engineering investments to support whole-body patient scanning safely and efficiently.

RAPID: Alcor launched the *"Readiness And Procedure Innovation Deployment"* research platform in early 2021. We budgeted to increase the number of cadavers to acquire for research this year to improve procedures, equipment, innovation, and advance our research. Alcor's primary surgeon has decades of surgical experience, is a Fellow of the American College of Surgeons, is well-published, and has given over 200 talks in seven (7) countries.

He also serves on multiple Advisory Boards, received post-graduate certificates from Notre Dame and Harvard Medical School, received numerous awards, was ranked by his peers as a Best of Phoenix Physician, and has over 15 years of surgical teaching experience. This year, he has agreed to train Alcor's medical response teams and our strategic partners to improve surgical procedures.

Education Pillar:

SST First Responders: Although I am confident Alcor's SST response capabilities are *the* gold standard in our industry, our response teams are not omnipresent. Short notice of a case presents significant logistical hurdles to overcome. We plan to organize SST training for first responders in critical geographic areas to combat Alcor's geographic distance from our members/patients and support our nonprofit educational mission. Trainees will be educated on cryonics procedures to be called on as first responders when a case presents, initiate basic procedures, and support our SST professional teams when they arrive on the scene.

50th Anniversary Conference: Alcor will be turning 50 years old on February 23, 2022! Alcor will plan a 50th Anniversary Conference in Scottsdale, AZ, to celebrate this landmark. We are currently targeting June 2022, depending on how the global pandemic develops. Alcor plans for this to be the biggest conference ever, and we are excited to educate our membership and anyone considering Alcor membership about cryonics. I hope you will attend our conference, Art, so you and I can enjoy a frosty beverage and each other's company.

Independent Cryonics Educator (ICE) Program: I am very excited about a new educational program Alcor launched, the Independent Cryonics Educator (ICE) Program! On November 30, 2021, Alcor's announced the *Donor Challenge* and shared our membership counts over the last 50 years. One of the most significant problems the cryonics industry has faced over the decades is raising awareness of our mission with the public. The ICE Program is a self-funded educational program that focuses on raising awareness with the public, according to Alcor's nonprofit mission.

The ICE Program will allow anyone to sign an agreement and refer prospective members to a cryonics organization, such as Alcor, *whether they are an Alcor member or not*. Cryonics enthusiasts, cryo-crastinators, members of other cryonics organizations, Alcor members, and any other person interested in educating the public about cryonics may participate in the ICE Program.

For anyone participating in the ICE Program, Alcor will issue a unique ICE Code to them. The ICE Code is an identifying code unique to each Independent Cryonics Educator (ICE) and will serve two purposes. First, the ICE Code will identify which ICE will receive compensation and how much from referrals for new members. Second, the ICE Code will determine what discount level is applied to a new member's first-year dues. The compensation schedule for Independent Cryonics Educators and discounts available for new members will be on our website.

Alcor's Board and I firmly believe our ICE Program will provide substantial economic incentives for individuals to educate the public about cryonics and potential members to take advantage of the first-year discount off dues. The ICE Program can drive unprecedented growth of Alcor membership and development for the entire cryonics industry. I believe the prospect of this program is so powerful for the whole of the cryonics industry that we have decided to invite other *reputable* cryonics organizations to participate in our program, *free of charge*.

Part of our mission is to "*Provide public education as a means of fostering growth…*" and we believe the power of this new program should not just benefit Alcor; it should help the entire cryonics industry. I have already contacted the presidents of other cryonics service organizations inviting them to discuss this program with me. Alcor will plan to include other reputable cryonics service organizations interested in participating.

Revival Trusts: We have witnessed an increased interest and demand from our members for revival trusts. A revival trust is an instrument designed to accumulate assets after an Alcor member is cryopreserved and is awaiting their return to a healthy and functional state. A Trustee manages assets like other trusts, then returns assets to our patient/member upon their successful revival. For Alcor members/patients, we appoint "Trust Protectors" to be a watchdog over the Trustee while our patient is cryopreserved, participate in determining a successful revival of our patient, and, hopefully, help facilitate the return of assets held in the trust to the patient/member.

Alcor currently has a model revival trust known as the "Asset Preservation Trust" (APT). We provide our model APT to Alcor members free of charge, and our members work with their estate planning attorneys to formalize their revival trusts. The model APT was developed many years ago. It is overdue for a rewrite with enhanced language designed to address perverse incentives and better protect Alcor patients and their assets.

Alcor will use part of your generous donation to update our model APT with expert estate counsel. Additionally, Art, we will rename the "APT" to the "**Alcor Revival Trust**," or "**ART**" for short. Once the new Alcor Revival Trusts are available, we intend to provide them to Alcor members free of charge, thanks to *your* generous donation.

Closing:

There are several mission-critical strategies your generous donation enables Alcor to advance. We have chosen only a few of the most impactful and affordable initiatives from our roadmap; however, there are still many more business investments to make as I look to the future.

Art, in the years to come, Alcor will lead a new dawn of scientific discovery, technological advancement, and the emergence of a *universal life-saving medical procedure*. As Alcor grows, we will make investments, in-house and through partners, to advance scientific research. Scientific research will lead to new procedures and technological developments. The scientific community will begin to understand cryonics is not a science or a pseudoscience. They will recognize cryonics procedures are *applied science*, just like medicine, and innovations in cryonics are *technology*, just like Medtech. Alcor will lead the charge on breakthroughs that advance cryonics, and I look forward to the day when Alcor is accepted as a thought leader in the healthcare community.

I hope you are pleased with how we invested your undirected donation, and this letter reinforces the confidence you have in our ability to manage and invest these funds wisely. Alcor has a lot of ground to cover, and I hope more donors will support the most aspirational and noble mission in history. Again, you have my sincerest appreciation for supporting Alcor's all-important mission, Art. Thank you.

Respectfully Yours,

Patrick Harris, Sr.
President & CEO
Alcor Life Extension Foundation

How to Maximize Your Odds of a Good Cryopreservation

By Max More, Ph.D.*

You completed the paperwork and financing arrangements. You are signed up for cryonics. Congratulations! Give yourself a pat on the back. You are ahead of most people. You are one in a million! Actually, more like one in 2.5 million. You learned about cryonics, you investigated, you acted. You are no longer stuck in the dreaded cryocrastination swamp.

Now you can sit back, relax, secure in the knowledge that you've put on the safety belt for your continued existence. Right? Alas, no. Suppose you were planning on going out for the evening and you were being picked up by a friend. You get in her car and put on your safety belt. Would you then be satisfied with your safety, even if you could strongly smell alcohol on her breath and struggled to understand her slurred words? Of course not. There are other steps you can and should take to improve your chances of being cryopreserved under good conditions.

You already know that. So why don't I go away and stop annoying you? *Because you are not doing many of the things you could do!* Many members leave undone many of the practical measures they could take. You may be the exception. But you probably haven't recognized and acted on every reasonable step. I'm no exception. Writing this article reminds me of several things I should do to ward off problems and smooth the way to a clean and effective cryopreservation.

I compiled the list of measures based on my experience as a member since 1986, my active involvement in dozens of cryopreservations, and on input from other experienced members. This article provides you with a checklist of actions to take to reduce your physical, medical, financial, and legal risks.

Health and medical

Avoid dying early and without warning. I sense your thoughts. Maybe "Well, duh!" or "Yeah, sure, I'll get right on that." But there are things you can do in this area, and some pro-health measures may be more important than others in a cryonics context. A sudden death will make it impossible for your cryonics organization to start the process as early as possible. If a sudden death is not immediately discovered, the ischemic time may result in a poor perfusion or inability to perfuse you at all. (By the way, I will use "death" as shorthand throughout for "clinical and legal death".)

When a death is both sudden and unexpected, especially when you're young, the coroner or Medical Examiner may insist on an autopsy. Unfortunately, a "religious objection" won't stop them. They have all the power in that situation. We may be able to talk nicely to them, politely asking for a minimal autopsy. In some cases, we might file an injunction. Even if we can get one quickly, the autopsy may already be over. It's not unknown for coroners to move cryonics cases to the front of the line if they know an injunction is coming. Autopsy is unlikely in most places if you die of a critical condition that everyone knows about, especially if you're in a hospital or hospice.

Although accidents can cause sudden death, by far the most common cause is cardiovascular disease leading to a heart attack, stroke, or aneurysm. The good news is that a relatively low proportion of Alcor members die from cardiovascular conditions. You don't want to be one of the minority. I'm not going to give specific health advice here, but get regular aerobic exercise, eat healthily, don't smoke**, and stay lean. If you keep your vascular system healthy even as other parts of your body break down, you are less likely to die suddenly and unexpectedly and more likely to get a good perfusion. It will also help prevent you from dying early. The longer you can hold out, the more advanced the cryonics procedures will be and the more secure the organization.

Some cancer treatments can increase the risk of cardiovascular problems. If you find yourself in that situation, you have a difficult choice to make. It may also be the case that some diets intended to reduce cardiovascular disease may increase cancer risk. An older and less controversial example is the government's recommendation to switch from saturated fats to polysaturated fats. Some common polyunsaturated fats are inflammatory and may damage the endothelial lining. Investigate the dietary literature for yourself and decide what is likely to minimize your risks. If you must choose, consider preventing heart disease over preventing cancer. (Of course, a tiny bit of heart disease is preferable to a large amount of metastasizing cancer.) Older members should get regular blood panels and imaging to detect early signs of vessel narrowing.

Don't be obese. Yes, it may be true that a modestly obese person who gets a lot of exercise is healthier in important ways that a lean person who never gets off their skinny butt. But a slim person who exercises beats both. The more obese you are, the greater the risk of an unexpected and sudden death. Your immune

system will be weaker. (COVID has made people more aware of this, at least if they have looked at the numbers of obese people in the ER.) You will cool slower in an ice bath. Since damage accumulates with time, the longer it takes to cool you, the more damage you will endure. Rapid cooling to induce hypothermia is critical since damage happens faster at warmer temperatures.

Highly obese individuals (at least those signed up for whole body) may present serious difficulties in surgery for cryoprotective perfusion. Highly obese people can be difficult to transport and not just in terms of being hard to move. Airlines limit the amount of ice (and dry ice) that can be used. If you are too big, you may not get enough ice to cool you optimally. You might not even fit in the shipping container. Obesity is strongly correlated with the deadly triumvirate of heart attack, stroke, and aneurysm. Obesity is a major risk factor for Type 2 diabetes, and diabetes itself is risky to have. Type 2 diabetes can often be prevented, controlled, or reversed by dietary changes.

Give Alcor access to your relevant medical information. For example, if we know that you've had extensive cardiac surgery and your chest is heavily wired, advance notice will allow the surgeon to find alternative cannulation locations without delay. Having medical records readily available also may enable Alcor to prevent or minimize an autopsy. If the coroner or ME can be shown relevant records, making it clear that this is an expected death, they may settle for a virtual autopsy – a CT scan and toxicology panel – or an external exam, or waive the autopsy altogether. Alcor has experienced all of these situations.

Expecting relatives to provide this information quickly when you are dying or have been pronounced is expecting too much. Relatives can be very difficult when it comes to accessing medical records, even if they are well meaning. They act as a gatekeeper, slowing things down, and they may be stressed, confused, or in denial.

Record a video testimonial while of sound mind laying out your wishes concerning cryonics and end-of-life care. It's easy. Use your camera phone or webcam. Provide Alcor with a copy and also give it to supportive relatives and your medical power of attorney. Ensure that your statement is consistent with your **Living Will**. Your Living Will obviously should be explicit and firm about your cryonics arrangements. In the Living Will and video testimonial, state the conditions under which you should be listed as "do not resuscitate" (DNR).

Avoid "ventilator brain." If you are kept on a ventilator when you are unlikely to recover, your brain may lack circulation. By the time legal death is declared, your brain may have largely dissolved. To cryonicists, this is an especially deadly risk of extreme critical care. You might ask your Medical Power of Attorney to push to monitor your brain activity if you are unconscious and on a ventilator. If brain activity ceases, you want to be pronounced as soon as possible.

- ✓ Avoid dying early and without warning
- ✓ Don't be obese
- ✓ Give Alcor access to your relevant medical information
- ✓ Record a video testimonial
- ✓ Avoid "ventilator brain"
- ✓ Avoid suicide
- ✓ Inform Alcor (and your local support group) if you are having major surgery
- ✓ Wear the bracelet or the neck tag and carry the wallet card
- ✓ Consider looking into medical alert systems
- ✓ Keep your member information updated
- ✓ Ensure that you are current on dues
- ✓ Avoid conflicts in your financial arrangements
- ✓ Include a disinheritance clause
- ✓ Provide a reward for family members or friends who assist in getting you to Alcor
- ✓ Avoid dangerous places and activities, especially if far from help
- ✓ Relocate to the Phoenix/Scottsdale area
- ✓ Relocate to a state with death with dignity laws
- ✓ Scout out cooperative funeral homes in your area
- ✓ Talk to family and friends
- ✓ Get relatives to sign a Relative's Affidavit

Avoid suicide. Outside of a "death with dignity context", suicide usually leads to an autopsy which is very bad for cryonicists. "Avoid suicide" is a decent general rule but overly simplistic. While Alcor takes no position on the issue, non-legal suicide can be understandable. If you are suffering terribly and you are definitely not going to get better, deciding to terminate your life is understandable. For cryonicists, there is an added complication. You might think that because someone killed themselves, that means they don't want to be cryopreserved. This is not always true. They may want to end their suffering but know that if they are cryopreserved and revived, life can continue without pain and misery.

In the case of suicide that is not legally sanctioned, your best bet is to make very clear to everyone who knows you what you are doing, and to make utterly clear the means you use. Alcor has experienced such a case and the member's careful preparations enabled us to avoid an autopsy. Although Alcor takes no position on suicide, Alcor will do its best to secure a patient if that is their stated wish.

Notification

If you develop a potentially life-threatening condition, contact Alcor's Medical Response Director. When, or if, your conditions become serious, the MRD will add you to the Watch List. That allows Alcor to keep track of your status. The frequency of check-ins will increase as the condition worsens. This allows time for logistical planning, checking paperwork, and preparing all the other elements of a standby, stabilization, and transport. It shouldn't have to be stated: **Inform Alcor (and your local support group) if you are having major surgery or other potentially fatal treatment.** I've been surprised and disappointed to hear multiple times of members who undergo major surgery and don't let us know beforehand – or let us know as surgery is about to start!

All members are issued a bracelet or neck tag along with a wallet card that urges medical providers to contact Alcor in a medical emergency. **Wear the bracelet or the neck tag and carry the wallet card!** If you're like me and don't like things hanging around your neck, wear the wrist bracelet. If the jangling metal bothers you, upgrade to a watch-style band. These do work. Alcor has been notified of medical emergencies and critical events because of these simple notification tools.

If you know you are at risk of a potentially fatal medical event, **consider looking into medical alert systems.** People at risk of stroke were some of the first adopters of these systems. By detecting falls, treatment can be administered sooner, preventing clots and potentially reducing the damage done. None of these systems are ideal for cryonics purposes but some can help. There are a number of free apps you can use on your phone that alert a number of designated persons if you do not check in once every 24 hours. One example is Snug.

Alcor is offering a service where the member receives a call daily (or a text). If they do not reply promptly, the situation is escalated. This doesn't eliminate all the delay but could reduce ischemic injury by hours. If you are interested in this service, contact Alcor's Case Logistics Officer to see if it is available for you.

If you are in hospice or hospice at home, you should **arrange 24/7 nursing service with ability to pronounce**. This will not be cheap. It is important because it can take an hour or more to get someone from an agency to come and pronounce you. During that time, Alcor cannot take any measures to reduce ischemic injury.

Financial and membership

Keep your member information updated. In particular, if you realize that a relative is hostile to cryonics, inform Alcor. (And legally bar them from any influence over your remains or finances.) You may need periodically to update your emergency contacts, power of attorney, and so on. You can find articles in the Alcor library covering these measures in detail.

Ensure that you are current on dues. You don't want your membership to be canceled and leave you unprotected. Also ensure that your cryopreservation funding is still secure. That could mean checking on life insurance or annuity funding for both the amounts and to confirm beneficiaries.

Avoid conflicts in your financial arrangements. You create terrible incentives if you leave all your life insurance or other funding to relatives in case you are not cryopreserved. You may insist that your relatives would never do this to you. But we've seen it happen all too often. Once you are no longer living, your wishes may suddenly matter less.

Use both a carrot and a stick. You want to deter relatives from interfering with your cryopreservation. **Include a disinheritance clause** so that anyone who frustrates or tries to frustrate your cryopreservation gets nothing. On the carrot side, in your will **provide a reward for family members or friends who assist in getting you to Alcor.** The reward doesn't even have to name individuals. You could just leave $10K to the first person to call Alcor to report your death or looming death. In both cases, tell people about these incentives and disincentives. They won't work if they are unknown until it's too late.

Physical environment

Avoid dangerous places and activities, especially if far from help. If you love scuba diving, extreme sports, or hiking in remote wilderness, you may be willing to take on the risk. Be mindful of the extent of the risk. Travel outside the country, especially to places that are remote or less developed, could make it difficult to get to you quickly.

Consider what could happen when you are away: Heart attack,

stroke, burst appendix, infection, life-threatening accident. You might think about getting additional medical insurance for international travel. This made all the difference for an Alcor member in the 1990s who was in a car accident in Mexico. The local "clinic" was terrifying. The AAA insurance enabled him to get an air ambulance ride to San Diego. That may well have saved his life.

An extension of this point, even within your own country, is to avoid living in places lacking quick access by emergency services.

If you are terminal – typically defined as expected to die within six months – you have a couple of good options. The first is to **relocate to the Phoenix/Scottsdale area**. That eliminates travel time for the response team. We have had cases where less than one hour has elapsed between pronouncement and arrival at Alcor (with cooling and medication along the way).

The other option is to **relocate to a state with death with dignity laws** if you don't already live in one. This enables you to *schedule* your cryopreservation – or what is now being called cryothanasia. That ensures that a standby team is present and that logistical preparations have been made in advance.

No matter where you live, **scout out cooperative funeral homes in your area**. The right funeral home can be a real help in dealing with death certificates, rapid release from hospital or other facilities, transport, use of their building for private workspace for the SST team, and communications with local coroner or ME if needed.

Social environment

Talk to family and friends about your desire to be cryopreserved. In some cases, this may be difficult and uncomfortable. Do it anyway. In an emergency when you have to be rescued by a cryonics team, you do not want relatives blocking the way because they don't understand what's happening. It's especially important to inform your closest relatives. They are most likely to act as a communication barrier in an emergency. Also inform your primary care doctor. Informed relatives are more likely to be cooperative. If a close relative reacts with clear hostility, let Alcor know so we can note it in your records. We need to know who *not* to talk to.

Get relatives to sign a Relative's Affidavit stating that they will not interfere with your cryopreservation. This doesn't guarantee that they won't interfere but makes it harder. Don't take them at their word that they won't interfere, *especially* if they have shown hostility or distaste for cryonics. Get them to sign. Let Alcor know of family members who dislike your arrangements and could interfere.

If at all possible, live with someone else who will quickly find you if you die at home. If you're married or in a similar relationship, and your spouse or partner are supportive of your cryonics arrangements, you've got this one covered. If not, consider a housemate or living in shared housing. If you live in shared housing, try to have cryonicists as housemates. Even then, don't be a hermit. Check in on one another frequently.

Finally, ensure you have a medical POA who is cryonics-friendly. The medical POA is going to make medical decisions for you when you are incapable. It's crucial that they understand your cryonics plans and how that affects the decisions they may have to make. This takes us back to the beginning where we considered ventilators and "do not resuscitate" orders.

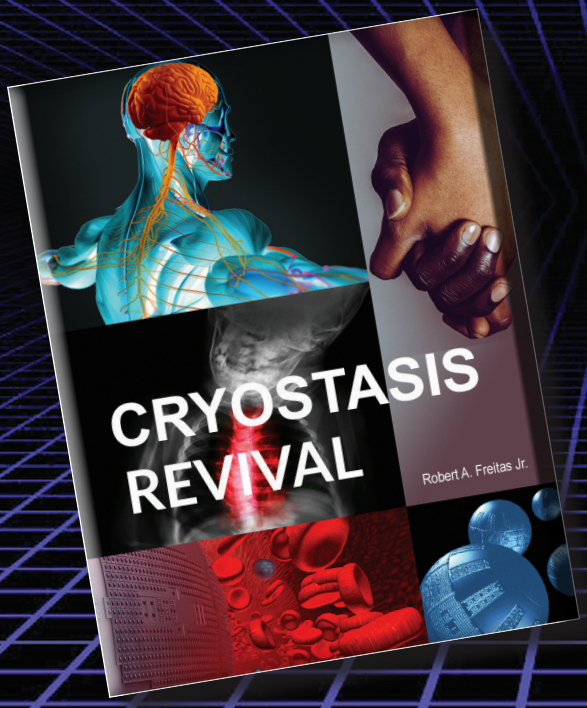
This might all feel a bit overwhelming. You don't have to tackle all of these at once! Pick the ones that seem most relevant and important in your situation and schedule an action step for a specific date. ■

*My thanks to the many people on the Alcor Officials email list who provided helpful input and feedback on a tight schedule.

** I'm simplifying here. I believe that our bodies can take a certain amount of "abuse" and recover. In fact, physiological stress (but not chronic or extreme stress) often makes you stronger in your immune system, your muscles, and your bones and connective tissue. A low single dose of radiation may not harm you at all. One cigarette or one donut may not have any bad effects. When stressors are not chronic or excessive, they can lead to hormesis: a process of conditioning and adaptation in which low levels of stress stimulate or upregulate cellular and molecular pathways that improve the capacity of cells and organisms to withstand greater stress. While it's not inconceivable that one cigarette per day may be harmless, can you stop at one? My mother smoked one a day for decades, allowing herself two on Christmas Day. I don't know of anyone else who has done this.

New Book by Robert A. Freitas Jr.

Cryostasis Revival: The Recovery of Cryonics Patients through Nanomedicine



Cryostasis is an emergency medical procedure in which a human patient is placed in biological stasis at cryogenic temperatures. A cryopreserved patient can be maintained in this condition indefinitely without suffering additional degradation, but cannot yet be revived using currently available technology. This book presents the first comprehensive conceptual protocol for revival from human cryopreservation, using medical nanorobots. The revival methods presented in this book involve three stages: (1) collecting information from preserved structure, (2) computing how to fix damaged structure, and (3) implementing the repair procedure using nanorobots manufactured in a nanofactory – a system for atomically precise manufacturing that is now visible on the technological horizon.

"Robert Freitas is an extraordinary thinker and author whose previous works have been transformational for our ability to visualize the extraordinary capabilities of future medical technology. In Cryostasis Revival, he now puts his prodigious previous knowledge of nanomedicine to the task of envisioning methods for healing those whose injuries challenge even the ultimate limits of future medicine. His illuminating results and new insights will greatly inform debate over, and may even help to resolve, controversies that have persisted for decades." — ***Gregory M. Fahy, Ph.D., Fellow, Society for Cryobiology & Executive Director, 21st Century Medicine, Inc.***

"Future repair and revival of damaged cryopreserved tissue has been the subject of speculation for decades. This book by a nanomedicine expert examines the problem in detail far beyond anything ever written before. With more than 3000 references, it's both wide-ranging and intensely specific about diverse technical aspects of the problem. It will surely stimulate much discussion, and be an invaluable resource for thinkers about nanomedical cell repair for years to come." — ***Brian Wowk, Ph.D., complex systems cryobiologist, Chief Technology Officer, 21st Century Medicine, Inc.***

"We now have considerable evidence that cryopreserved patients retain the physical structures encoding memory and personality. For most people, the difficulty lies in understanding how it could ever be possible to repair and revive patients. Leading nanomedicine expert Robert Freitas fills in that gap with admirable and remarkable depth. Cryostasis Revival provides an unparalleled clarification of pathways for researchers to explore in the quest to make human cryopreservation reversible." — ***Max More, Ph.D., Ambassador, Alcor Life Extension Foundation***

"Cryostasis Revival is the most magnificent tour de force on cryonics ever done with the signature flair, comprehensive coverage and authoritative style of Robert A. Freitas Jr. It describes all the issues involved in reviving cryopreserved patients: from the philosophical (what is "information theoretic death") to the practical (what damage actually takes place during a cryopreservation) to the technological (how to apply nanotechnology to restore a cryopreserved patient) and more. Nothing else even approaches such a complete and incisive treatment of this life-saving subject. Cryostasis Revival is the book to give anyone who's thinking about cryonics but "isn't sure about the science." — ***Ralph C. Merkle, Ph.D., Senior Research Fellow, Institute for Molecular Manufacturing***

Free electronic book and hardback copies for sale at:
https://www.alcor.org/cryostasis-revival

Be Extraordinary or be Dead

By Reason

Ordinary people don't pay much attention to the science of aging. Ordinary people don't keep an eye on the longevity industry or read scientific papers or donate funds to non-profits supporting important research. Ordinary people don't carefully and rationally self-experiment with plausible age-slowing interventions while measuring outcomes. Ordinary people are not signed up for cryopreservation. Ordinary people are not trying to gain access to new medical therapies a decade in advance of approval by regulators, or after approval but well before widespread availability. One could say much the same for ordinary high net worth individuals, by the way. Wealth is no escape from the median.

Which is all fine. Life is what you make of it, an instant of time that is all yours, come and gone in a flash before the yawning abyss of a billion years of a future empty of your present self. There is no meaning to this life beyond the meaning that you ascribe to this life. It is a narrow and winding path, a balancing act between nihilism on the one side and solipsism on the other. Every ordinary person that you pass in the street is their own snowflake of personal choices in ways that you cannot see, whether you judge them for it or not.

Like gravity at the cliff edge, the biology of aging is a force of nature that cares nothing for our opinions on these matters. It runs as it will, and there will come a time when you, and I, and every present adult that you know well will be faced with the consequences of past choices. Given the present state of aging research, and paucity of viable interventions that may slow or reverse aspects of aging, we will all have the one important choice. Every one of us will either have chosen to be extraordinary, to have learned about aging research, supported progress, and sought out therapies well in advance of widespread adoption, or chosen to be dead, accepting the mortality that attends untreated aging.

The processes of degenerative aging and consequent mortality will not wait on indecision. They will not wait for the regulators to slowly approve, or the scientists to slowly innovate, or the entrepreneurs to slowly meander their way towards practical therapies. The hammer will fall, and bodies will fail and die absent the means to treat aging.

In the matter of treating aging as a medical condition, to be extraordinary is to support research that will bear fruit in twenty to thirty years, whether as a patient advocate, funder of academic projects, or by starting a company to shepherd projects to the clinic. To be extraordinary is to read around the subject and try out the most plausible (and plausibly safe) approaches. To be extraordinary is to go to conferences, meet people, learn that the Intervene Immune trials for thymus regrowth are running, and arrange participation. Or the same for tests of Khavinson peptides, or learning how to source and use senolytics, or any number of other approaches that seem more rather than less likely to pay off. **To be extraordinary is to have an agreement with a cryonics provider and a plan to ensure that the arrangement works out.** To be extraordinary is to take better care of your health in the simple, effective ways that most people omit in this day and age. So few individuals are undertaking these initiatives in any rigorous way, and yet it doesn't take more time or will or effort than any significant hobby.

Be extraordinary or be dead. That choice lies ahead.■

Notable Women in Cryonics

By Taya Maki, President of Société Cryonics de France

I am from Vancouver Canada and have been living in France for the last 12 years. I am a mother of 2 girls, a Montessori school director, a bellydance teacher, a body artist, and a costumer. So in all my free time I try to advance the situation of cryonics in France. I have been a cryonicist for about 15 years and am currently a member of the *Cryonics Institute* and, more recently, *Tomorrow Biostasis*. I am also the president of the *French Cryonics Association* and have been trying to organise a community here in France with the goal of making local standby possible and eventually legalise cryonics in France!

As an avid cryonicist for over a decade, I am often surprised to see so few women as speakers at cryonics events, or in the public. That being said, there are some amazing women working in research, law, advocacy, public relations, and other various disciplines to support this ever-evolving field. In this article I will introduce you to a few of these outstanding individuals and see what their perspective is.

Linda Chamberlain

Linda is one of the first women to be involved in cryonics since the very early days. With her husband Fred, she was a founder of the *Alcor Life Extension Foundation* and one of the individuals who has contributed the most to the advancement of cryonics. See a more in depth look at her life here : https://www.alcor.org/library/alcor-member-profiles/linda-chamberlain/

1. How did you become interested in cryonics?

In 1969 I read the 1964 book *The Prospect of Immortality* authored by Robert Ettinger, a physics professor in Michigan. I was fascinated by the prospect that technology might offer a solution for the problem of death. I wrote to Ettinger and asked if there was a group of interested people in California, where I lived at that time. He responded with contact information for a group of people who were working on giving a conference on cryonics in California in 1970. I decided to volunteer to help with the conference as a means of learning more about cryonics and the folks in the local group.

During those working sessions, I met Fred Chamberlain III, who had just gone through the process as I had. We fell in love and a large part of our mutual bond was cryonics. As it turned out, Fred's father (Fred Jr) was not well and we knew he probably only had a couple years to live. The local cryonics group had a limited capability to freeze members, but all equipment and procedures were based on those used by the Ettinger group, which was mortuary practices and mortuary equipment.

Fred was a NASA engineer and I was in college. We just could not accept those limitations. We wanted to create capabilities that would be consistent with medical practices but the local group did not want to depart from their then current practices. So, Fred asked me to marry him and he would support us both financially while I worked full time to build Alcor. Even though it meant putting my education on hold, it was an offer I could not refuse. So, that not only answered how I got interested in cryonics, but also a little about how Alcor got started. My Member Profile goes into that at greater length.

2. What is the biggest challenge currently facing cryonics?

Alcor is still a very small organisation, even after 50 years. The most important thing we can do at this point is to dramatically grow the Alcor membership. With membership growth we will have more resources for all aspects of our mission.

3. What can we do to inspire more women to become involved in cryonics?

I have been asked this question for 50 years. I think the reason women have historically not been attracted to cryopreservation is because most women were not encouraged to seek a technical (STEM) education and therefore did not have the knowledge base to see the value Alcor offers. That has been changing over the last 5 decades, though. Today, we have a lot of female physicians, engineers, and professors. I think the best thing we can do as we work to build membership is to target professional women in these professions.

Carol Shaw

Carol Shaw is an electrical engineer and computer scientist who worked as a videogame designer for Atari in the 1980s. She is well known for being one of the first women in this male-dominated profession and designed the famous Atari and Commodore 64 video

game River Raid. She has been involved in cryonics and part of Alcor for many years.

1. How did you become interested in cryonics?

I had never heard of cryonics, but my husband, Ralph Merkle, had heard of it. He began going to some of the local restaurant dinners. Eventually, I went to the dinners, also. We both joined Alcor around 1988 or 1989. Eventually, Ralph became a member of the Board of Directors.

2. What is the biggest challenge currently facing cryonics?

Bureaucratic opposition.

3. What can we do to inspire more women to become involved in cryonics?

There are more women involved in cryonics than when I started. Meeting Linda Chamberlain at the Lake Tahoe Life Extension Festivals inspired me.

Natasha Vita-More

Natasha Vita-More, PhD is "an early adopter of revolutionary changes" (*Wired*, 2000), a "role model for superlongevity (*Village Voice*, 2001), and "advocates the ethical use of technology to expand human capacities" (*Politico*, 2017). She was awarded Space Camp Wings at the Space & Rocket Center in 1985. She authored the Transhumanist Manifesto, included onboard the NASA, ESA, ASI Cassini-Huygens spacecraft mission to Saturn in 1997. In cryobiology, she established a scientific breakthrough in cryopreservation of long-term memory in *C. elegans*. As an innovator, she designed the first future body prototype, which introduced the Metabrain concept. She appeared in more than two dozen televised documentaries, published numerous articles and books. Her experience in the field of foresight studies establishes principles and practices for assessing humanity's potential futures. Her proficiency as a professor of ethics has produced high-level scholarship toward understanding the challenges society faces. Natasha founded the Transhumanist Studies Program, is a Distinguished Senior Fellow at the Centre for the Future Mind a FAU, and Ret. Faculty and Chair of Graduate Studies Program UAT.

1. How did you become interested in cryonics?

I had been creating theatrical projects in the Amazon Jungle, Haleakala Volcano, Atlantic Ocean, Byzantine Architecture, Kyoto Kinkaku-ji Temple, and the Telluride Mountaintop Observatory. Each of these extraordinary yet remote environments caused me to wonder about the fragility of life. Through this fragility, humans have sought to evolve and to sustain and preserve life in all its forms. The idea of cryonics simply made sense to me. This common sense approach was heightened by advances in the field of infertility that used insemination protocols with frozen sperm and later freezing a healthy embryo in the 1980s. It was evident that the architecture of life was changing. I wanted to be a part of this change. I attended a cryonics event and signed up with Alcor in 1991.

2. What is the biggest challenge currently facing cryonics?

It is a daunting task to identify one single challenge or as you ask: "the biggest challenge"; however, in assessing the circumstances facing the challenges of human cryonic preservation within the larger field of cryobiology, I would settle upon society's inability to understand that death is not an absolute outcome. Death is a biologically programmed outcome resulting from the evolutionary architecture of our species from over 4 million years ago. Outside of the genomics of evolution that has barely advanced over this time frame; it is the vast and uncompromising issue of social perceptions and psychological attitudes. These perceptions and attitudes are exceedingly harmful because they blindly support the historical acceptance of death. This is the strongest and most adhered to belief among all of humanity. To counter this ingrained belief that so much of society is built upon and relies on is an arduous challenge. This challenge is far more serious than the need for investments in the science and technologies that will eventually revive cryonics patients. Further, and quite important to realize, is that the theoretical analyses of nanomedicine for being the necessary biomedical technology to re-engineer a person upon revival is no longer just a scrutinized fix to diseased bodies. Bar none, nanomedicine is the most important biocompatible technology being developed today. Second to this is AI systems to copy, transfer and store neurological activities that form the mind, consciousness, and personal identity.

3. What can we do to inspire more women to become involved in cryonics?

Ask those putting on events or writing about cryonics to please include the work and ideas of women who are doing scientific research, innovating technological systems, heading investment firms, and educating others about longevity.

The domain of longevity advocacy is saturated, and this is a very good thing. But what is missing? One area that I am focusing on is the secondary outcome of my published research that evidenced the persistence of long-term memory of *C. elegans* after cryopreservation and revival. This secondary outcome identifies a simple animal in the gestation period with embryos in-body during the cryonics and vitrification process and when revived laid eggs that hatched with healthy young nematodes.

This touches on the topic of reproduction and the survival of one of the most vulnerable of life forms, an embryo. How is this relevant to women? Because a strong and heartfelt connection can be made between cryonics and cryobiology's infertility field. The earliest forms of freezing cells were with sperm, embryos, and eggs. This helped many women who were dealing with infertility. Today millions of people walking around among us started life as a frozen embryo!

Carrie Radomski

Carrie is the President of the *Lifespan Society of British Columbia* and has successfully challenged Section 14 (anti-cryonics law) in the court and got a favourable ruling. The law remains unchanged but they were granted an exemption as a non-profit to offer cryonics services in BC. There is more about this here. https://www.lifespansociety.com/blog/anti-cryonics-law-challenge-resolution

The Lifespan Society of BC was incorporated as a non-profit in 2012. They are in the process of improving standby in Vancouver and the lower mainland now.

1. How did you become interested in cryonics?

I went to a presentation at UBC where Keegan Macintosh (Alcor member) gave a great presentation about cryonics. I signed up soon after. I signed up around the same time as my husband but we were not dating at the time.

2. What is the biggest challenge currently facing cryonics?

The biggest challenge facing cryonics is the extensive logistical challenges in getting people cooled down, vitrified and preserved in a timely manner to minimize warm and cold ischemia. I wrote about this extensively in the 2016 February Issue of *Cryonics* Magazine. *The Lifespan Society of BC* is working on improving standby, we purchased a *Cryonics Institute* Intermediate Kit and we had local member standby training in the fall of 2018. We intend to acquire more updated equipment from ICE and updated training in the near future.

3. What can we do to inspire more women to become involved in cryonics?

I am not sure if it makes sense to target women as a demographic since we have such a tiny number of cryonicists in general. I think if we get more people to join our cryonics cause then women will naturally come in. I know men outnumber women but if we increase our overall numbers then women will be better represented. In terms of strategy it makes sense to have better family-package plans. I believe that would help bring in family members of men who are signed up for cryonics and that would also potentially boost the number of women signed up.

Allison Duettmann

Allison Duettmann is the president of *Foresight Institute*. She leads various biotech and longevity groups, and has a high profile in the media sharing her research and insights. She co-edited the book "Superintelligence: Coordination & Strategy", and is collaborating on another book on Intelligent Voluntary Cooperation. She holds an MS in Philosophy & Public Policy from the *London School of Economics*, focusing on AI Safety, and a BA in Philosophy, Politics, Economics from *York University*. As a well versed scholar and public figure, Allison is also a longevity and cryonics enthusiast. Find her website here : https://foresight.org/

1. How did you become interested in cryonics?

I passively knew about its existence as a comforting plan B for a while. Only when my dog died when I was about 16, did I realize the urgency around creating working solutions and that you want to be better safe than sorry.

2. What is the biggest challenge currently facing cryonics?

(a) Better onboarding and user experience to make signing up and life insurance seamless.

(b) More basic research to improve the underlying science.

(c) Innovative companies to create a competitive industry; e.g., we just onboarded *Cryopets*, a pet cryonics company into our fellowship.

(d) Improved messaging, both public PR but also to increase support of immediate family members of patients.

3. What can we do to inspire more women to become involved in cryonics?

More female role models being outspoken about their cryonics support and integrating their positive experiences into everyday conversations, both in public and private forums.

Summary

As you can see, we have some outstanding and trailblazing women supporting cryonics, and this is but a short list of the

many more out there. I hope reading this may inspire and motivate other women to become involved either as advocates, scientists, lawyers, artists or in any field!

Often people think that if they don't have a scientific or 'tech' background there is not much they can do to help, but I disagree. No matter one's background, there is always a meaningful way to become involved. What seems clear to me is that we need more people in general to support this movement so that the choice of cryonics becomes widely acceptable internationally. As everyone said, prominent women showing their support for cryonics and being public about it could help other women consider this option and bring more members to the organisations worldwide. It could also create the heartfelt connection to reproduction that Natasha mentioned.

Feel free to reach out to me or any of these great women if you would like to talk about it. There are also many conferences and events where you can learn about the field and meet others with the same interest. The more we connect, the stronger we are to create change.

In hopes for a longer life in health and happiness,

Taya ■

An Institutional History of Alcor

By R. Michael Perry, Ph.D.

Introduction

As I write this, Alcor is about to celebrate its 50th anniversary as a cryonics organization (Feb. 23). Recently a longer history was started in these pages,[1] which is to be continued, but for this issue a briefer survey covering a larger span of time seemed appropriate. Here our subject matter is restricted to major organizational events such as incorporation, locations, past presidents (in brief), collaborations with other organizations, and the like, with some details added in hopes of more human interest. Beginnings are important in any historical process. The early years are emphasized here, including the prehistory of Alcor, though I've tried to give coverage to later events also.

Technical matters: Arial Narrow typeface *is used for longer quotations, which I've very lightly edited in places to correct minor errors such as spelling or punctuation. Inserted material is enclosed in square brackets* []*, deleted material is indicated by ellipsis .... Photos not otherwise attributed are from (or can be found in) Alcor archives [15].*

Prehistory through 1970s

Startup

Alcor, the creation of Fred and Linda Chamberlain, has roots going back to the very early cryonics movement. A pivotal event in starting this movement was the 1964 publication (by Doubleday) of *The Prospect of Immortality* by Robert Ettinger. There the idea of freezing the newly deceased for possible, eventual revival was introduced and given justification on scientific and other grounds. A second major milestone was the formation, in 1965, of the Cryonics Society of New York (CSNY), an organization dedicated to implementing Ettinger's idea and assisting in the formation of similar organizations in other parts of the country and possibly elsewhere. (The term "cryonics" was coined by one of the New York group, Karl Werner, specifically for this organization, but soon was being applied to the practice as a whole.) The two leading CSNY activists, Curtis Henderson and Saul Kent, made a cross country trip in 1966 which resulted in the formation of Cryonics societies in Michigan (Ettinger's home state) and California (CSM, CSC, respectively), the latter headed by Robert Nelson in the Los Angeles area.

By the end of 1970 Fred Chamberlain and Linda McClintock, who had independently read Ettinger's book with approval, had both joined CSC, and had met and become a couple. Fred meanwhile had become vice president of CSC. At Nelson's suggestion the Chamberlains worked to form a "rescue group" that they called "Alcor" for cryonics cases involving CSC. The name referred to a faint star in the Big Dipper that historically had served as a "test for clear vision" and also was an acronym for Allopathic CryOgenic Rescue ("allopathic" as distinct from "homeopathic" medicine. Allopathy means treatment of disease by means that have effects opposite to that which is being treated, whereas homeopathy means treatment which has effects similar to that being treated and has been well discredited in scientific investigations.[2,3]) But Nelson proved hard to work with, and soon the Chamberlains left CSC and started their own organizations, Manrise Corporation (1971) and The Alcor Society for Solid State Hypothermia (1972). Two organizations were wanted in this case: Manrise, a for-profit, would provide cryonics services including long-term, cryogenic storage, while Alcor, a non-profit, could accept anatomical donations, that is to say, members legally deceased, who would then be serviced by Manrise.

Fred and Linda Chamberlain about the time they founded Alcor

Alcor's Incorporation

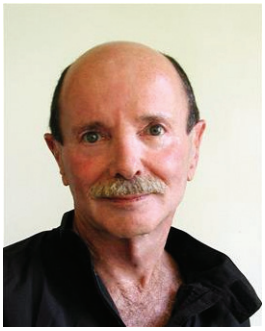
Alcor, officially named the Alcor Society for Solid State Hypothermia, came into being in the State of California on Feb. 23, 1972. ("Solid state hypothermia" is synonymous, essentially, with "the state of cryopreservation.") The articles of incorporation, signed Jan. 27, 1972 and amended May 1 that year, list the primary purposes of the organization and limit its activities accordingly:[4]

The purposes for which this corporation is formed are:

(a) The specific and primary purposes are to conduct, promote, encourage, and further research and study in the field of cryobiology, including the induction of solid state hypothermia.

(b) The general purposes and powers are to foster, promote, conduct and further knowledge in the field of cryobiology and gerontology by means of the interchange of ideas and information among the members, by research in the aforementioned sciences and technical arts, by engaging in any scientific and educational activities within the meaning of section 501 (c) (3) of the Internal Revenue Code, and to purchase, lease, acquire, hold, own, use, operate, mortgage, sell, hypothecate, or otherwise dispose of real and personal property and technical equipment as may be incidental to or used for or in connection with the aforementioned purposes of this corporation.

(c) Notwithstanding any of the above statements of purposes and powers, this corporation shall not, except to an insubstantial degree, engage in any activities or exercise any powers that are not in furtherance of the primary purpose of this corporation.



Millard Tipp[6,7]

The first address of Alcor, listed in the Bylaws, was at the Chamberlains' residence in the Los Angeles County hamlet of La Cañada ("the canyon" in Spanish, pronounced "La Can-YADA"). (Alcor would soon have a business address in Verdugo City, which appears to have been current for several years.) To meet a statutory requirement, the two Chamberlains added their Los Angeles friend, Millard Tipp (first name pronounced Mi-LARD), as third incorporator. (A photographic artist who lived from 1932 to 2012, Tipp was only with the fledgling Alcor for about a year.[5] Later diagnosed with Parkinson's, he founded the Los Angeles chapter of the National Parkinson Foundation and devoted his life to volunteer counseling.[6,7])

Early Alcor Features and Interactions

Fred and Linda Chamberlain later (1998) commented on the early days of Alcor:[8]

In the beginning Alcor's resources were mostly the resources of Manrise Corporation, including a 100+ page manual on suspension procedures and the first specialized equipment for cryonics perfusion which had ever been designed and fabricated. Our medications were primitive, by today's standards, but they represented the best advice of the cryobiological community at that time, plus all the consulting we'd been able to beg and borrow.

For the first two years or so, there were only five members. Fred Chamberlain, Linda Chamberlain, Dick Jorgensen, and Julie Schultz were Alcor's initial "active members." Fred's father, a stroke victim of many years, was not only Alcor's fifth member, but literally its "reason for being." Were it not for "Fred Jr.'s" state of declining health, Alcor might never have been formed.

(Fred's father, Fred Jr. – Fred himself was actually Fred III – was cryopreserved by Alcor in July 1976 as their first case and the movement's first head-only or neuro preservation. This option, including brain-only preservation, is advocated as a cost-saving measure though the whole-body alternative also has its strong advocates.[9,10])

Continuing with Fred and Linda's report (excerpted):

From '72 to '76, Alcor primarily sought membership from libertarian sources. First, mailing lists were used to conduct a well-advertised seminar (30 people came.) Then Alcor members became closely allied with the Free Enterprise Institute (FEI) of Andrew J. Galambos. Galambos was lecturing throughout the Los Angeles Basin and elsewhere (his lectures firmly stated that cryonics was going to be an integral part of future society.) When Fred Jr. was frozen in 1976, virtually all of the team were "FEI'ers"!

During this period, also, Mike Darwin (then a teenager) moved to California for approximately a year and a half. He conducted viability research, supported by Manrise Corporation, and contributed heavily to the outfitting of a surgical laboratory within a large van, and in the acquisition and modification of a small "retrieval vehicle" (not exactly an ambulance, but close) with on-board gurney and [heart-lung resuscitator (HLR)].

Membership and Board of Directors

The November-December 1972 issue of *Manrise Technical Review* contains a several-page summary of Alcor covering everything from choice of the name to directorate structure, scientific research and data compilation, training, and rescue capabilities.[11] Written/arranged by Julianne Schultz, this highly informative and interesting article is quoted here on membership classes and elections to the Board of Directors. (Complete report in [1].)

The Alcor *General Member* is a dues-paying individual who has made legal (anatomical donation) and financial (insurance, trust fund, etc.) provisions for rescue procedures and suspended animation. The General Membership classification is applicable to each member's first year of association with Alcor and can, by choice, be maintained indefinitely with payment of insurance policy premiums and increased annual dues.

It is the option of the General Member, during the first year, to train for qualification as a Working Member. This is accomplished by successfully completing the Alcor Training Program. The Working Member pays reduced annual dues, and is obligated to volunteer 40 hours of personal effort per year in maintaining skills through refresher courses.

The *Director Electorate*, a third classification of membership, is an annually elected body of Working Members having the only power within the corporation to elect Directors and members of the Director Electorate. In essence, this is the controlling body of Alcor. The Director Electorate allows for a broad but stable basis for control outside the Board of Directors.

The Director Electorate, then, was a self-perpetuating body which also elected Directors. (There was a mistaken rumor that General Members elected Directors – not so.[21]) In 1978 the newly revised Bylaws provide for "Alcor Representatives" rather than Director Electors[12] but not long after it was decided to have Representatives just all be Directors and by 1987 this was adopted into the Bylaws. The Directorate was now self-perpetuating and would itself elect all officers along with Directors.[12,13,14]

Alcor's First Newsletter

Alcor's first newsletter, *Alcor News*, began with the May 1976 issue and continued until August 1978, 24 issues in all. It was edited by Linda Chamberlain. In addition to local events (meetings and such) it covered such topics as the 1976 cryopreservation of Fred Jr., the election of presidents, and the 1977 merger of Manrise with Trans Time, a cryonics organization in the Bay Area, California.[20,21]

Alcor Presidents

Linda Chamberlain became the first president of Alcor at its incorporation in Feb. 1972. Fred meanwhile had been president of Manrise since its inception the previous year. A year later, in Feb. 1973, there was a switch of CEOs: Fred became president of Alcor and Linda took control at Manrise.[15] Another switch occurred, August or September 1975, with Linda returning to control at Alcor. A year later Allen McDaniels, M.D., became president of Alcor.[16,17] Finally, Laurence Gale succeeded to the presidency in June 1977,[18] a position he would hold into the following decade.[26]

Alcor presidents. From left: Linda Chamberlain (as Linda McClintock), cryonics conference, Los Angeles, May 1970[30]; Fred Chamberlain and Allen McDaniels at Fred Jr.'s cryopreservation, Jul. 1976; Laurence Gale about 1980.

Manrise Merges with Trans Time[19]

The September 1977 *Alcor News* contained this notice:

It has been a long job and many people have expended a great deal of time and effort but the final merger agreement between Manrise Corporation and Trans Time, Inc. is at last signed by all parties. There is still accounting and legal work to be done, but an agreement acceptable to all finalized the merger on October 1, 1977.

The merger produces an organization of greater strength and longevity than either organization had separately. Alcor feels this merger is a step toward our own greater safety as a reflection of Trans Time's improved ability to meet the demands of the future.

Effectively, Manrise ceased to exist while an augmented Trans Time continued to provide cryonics services for Alcor and others, including storage of Alcor's then single patient.[21] The following December's issue reports on Jerry Leaf's efforts to assemble a perfusion team in which "participation will be compensated with Trans Time stock." In addition:

Mobile teams may be dispatched from Los Angeles to remote areas for standby alerts and/or freezings. Donors who are terminally ill may be flown to Los Angeles so as to be frozen under ideal conditions. Those of you who have read about Jerry Leaf's activities in Life Extension Magazine (now changed to Long Life Magazine) can recognize that this is an outstanding opportunity to learn surgical skills generally acquired only by physicians who specialize in surgery.

(Author's note: *Life Extension/Long Life* was a newsletter published 1977-80 by Patrick Dewey in Chicago, covering the life extension field including cryonics and anti-aging research.[21])

Alcor Name Change

Alcor stayed "Alcor," but it was otherwise time for a name change, as related in the November 1977 newsletter:[22]

Alcor is an organization whose members are interested in all aspects of life extension. Cryonics has always been considered a life-net, a last effort – but not sufficient in itself. Alcor's members are seeking extended lifespans as well as a high quality postponement of "old age". As a name, the "Alcor Society for Solid State Hypothermia" was too limited. Thus, Alcor has legally changed its name to the *ALCOR LIFE EXTENSION FOUNDATION*.

1980s

With the new decade came numerous developments worth reporting, among them Alcor's switching service providers, mergers with other organizations, changes of leadership and location, a new Alcor newsletter, and legal battles that (while unpleasant!) would overall strengthen the organization and the cryonics movement as a whole.

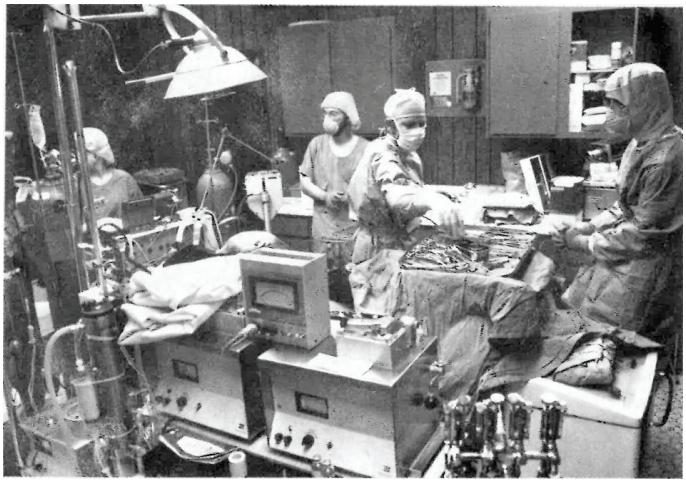
Merger with IABS

Steve Bridge and Mike Darwin, living in Indianapolis in the mid-1970s, shared an interest in the new field of cryonics and decided to start two organizations in their area to further this interest. Bridge would head the Institute for Advanced Biological Studies (IABS), and Darwin would similarly lead Soma, Inc. Both organizations were devoted to research aimed at human cryopreservation and both cooperated, though their efforts (perfusion and cryopreservation) were limited to animal models.[23,24,25] After a few years a decision was made, in the case

of Soma, to terminate operations, and for IABS, to merge with Alcor (with Alcor retaining the name):[26]

At a joint IABS/Alcor board meeting held on September 12, 1982 both IABS and Alcor voted unanimously to functionally merge the organizations. After several weeks of discussion it was decided that Alcor's corporate framework would be utilized by the "joint" organization since Alcor is a California corporation and has the larger number of donors signed up. Directors from both IABS and Alcor agreed that the Alcor name was the better of the two for public relations and promotional activities and decided to retain Alcor as the name for the new organization.

At the same meeting Mike Darwin, who had moved to southern California from Indianapolis, became president of Alcor. Though prominent in research, Mike also would reorganize Alcor and put the members' funding on a sound basis.[58]



Dog washout (perfusion) experiment at IABS facility, Aug. 1979. From left, Anna Schoppenhorst, cryobiologist Dr. Corey Noble (a pseudonym), Jerry Leaf, and Mike Darwin.[25]

New Newsletter

Cryonics had been the publication of IABS (this title having started with issue #8 dated March 1981. Before it was simply *The IABS Newsletter*.) With the merger, and the November 1982 issue (#28) *Cryonics* became Alcor's publication, and has been so ever since.

Jerry Leaf and Cryovita[27]

After wartime experience in Vietnam, Jerry started working in the operating rooms at UCLA. In time he became an instructor in thoracic surgery, co-authored over 25 papers from the UCLA laboratory, and set up a program for the cryogenic storage of heart valves and arteries for transplantation into children. Meanwhile he began to acquire equipment for his own use. In 1977 at Trans Time he directed the first total body washout and recovery of a dog by cryonicists. (The animal lived 17 hours.) Later that same year he was the team leader in Alcor's first experiment, a cryopreservation of a dog whose tissues were tested afterward for quality of preservation. (Recovery of live neurons from liquid nitrogen temperature was demonstrated.) Jerry soon set up an independent company, Cryovita, to further pursue this work, opening an office in Fullerton, California in 1978.

In the years following, Cryovita would work closely with Alcor. Cryovita replaced Trans Time as their service provider. Alcor would also be headquartered at the Fullerton address, and the two patients then at Trans Time (Fred Jr. and Hugh Hixon Sr.) would be moved from Trans Time's facility to this address. (The two organizations moved to a facility in nearby Riverside in 1987.) In July 1984, Alcor/Cryovita under Jerry's direction, assisted by Mike Darwin and others, revived a dog after total-body washout and hypothermia. It became a long-term survivor with no detectable deficits, which again was the first achievement of its kind by a cryonics group. (A non-cryonicist, Gerald Klebanoff, had pioneered this work in the 1960s.) Soon Jerry and Mike were reviving dogs from 4 hours of bloodless perfusion at 4°C, which lent much confidence that at least the initial stages of a cryopreservation were reversible.

Another Merger[28]

The January 1985 *Cryonics* reports on a merger of Alcor with another cryonics organization, the Cryonics Society of South Florida (CSSF), again with Alcor retaining the name:

After eight months of preparation and planning it's finally official: CSSF and ALCOR have merged! ALCOR President Mike Darwin and Jerry Leaf, President of Cryovita Laboratories, went to Florida on November 10th for a combined training session ALCOR paperwork party. On November 18th [1984] CSSF President Glen Tupler signed the final piece of paperwork making the merger official, and the overwhelming majority of CSSF members completed their ALCOR suspension paperwork. Probably never before in the history of cryonics have so many sets of suspension paperwork been filled out in so short a period of time (two weeks!).

This also marked the effective completion of Cryovita Laboratories' contract to set up a cryonics suspension facility in the Miami area and train the cryonicists there to do the necessary transport procedures to get a deanimated patient to the facility.

The merger was undertaken for a variety of reasons. CSSF has been plagued by the usual problems any small cryonics group faces, shortage of volunteers for routine administrative tasks and record keeping, and a high cost per member for undertaking such administrative tasks. It hardly makes sense to have organizations with only 10 or 15 members bearing the full burden of accounting, administration, research and so on when these tasks can be centralized and the fixed costs spread out over a larger number of people. ALCOR was in much the same position. By combining forces, CSSF and ALCOR should be able to greatly increase their efficiency and avoid needless duplication of effort.

Legal Battles[33]

A clash with officialdom started in late 1987 when Alcor was at the Riverside address. Dora Kent, the aging, ailing mother of cryonics pioneer Saul Kent, arrested at the facility with no physician present to pronounce the deceased. When she was cryopreserved (as a neuro) the local coroner accused the Alcor team of having started the procedure prior to, and hastening death, an impression conveyed by metabolites found in the body tissues. But, as Alcor officials pointed out, the metabolites could have been introduced postmortem by the metabolic support used to minimize deterioration in the early stages of cooling. The upshot was that no charges were filed, and Alcor's operations continued unhindered; but a climate of hostility was fostered that, it is safe to say, would not lose its force until Alcor had moved to another state (next section).

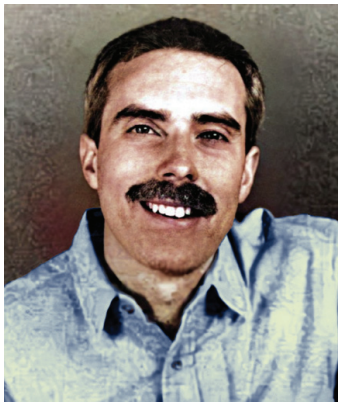
A second clash with the state bureaucracy erupted when, in the following year, Alcor did its first whole body case, Robert Binkowski. Up to then Alcor had done only head-only cases, which are officially classed as tissue samples, whereas the full body is a "dead human body" and has a different, more stringent set of requirements that must be met for its "disposal," whatever form that might take. The upshot was that Alcor was supposedly in violation of state law to do this sort of thing since they lacked proper licensing. When an inquiry into just how to obtain the licensing was made, it turned out that no apparatus had ever been put in place for it, that is to say, for "cryonic suspension" – how could it have been? We were rather in the position of someone being told they had to get a car license in a jurisdiction with no Motor Vehicle Department.

Fortunately, with generous financial help from interested parties, an excellent Constitutional attorney was hired (Christopher Ashworth) and both matters were settled in court, in Alcor's favor. The contests however were harrowing for those of us who were involved – would Alcor and cryonics in the whole of California be shut down? What would become of the patients? (Some of us were also taken into custody in handcuffs early on, in connection with the Dora Kent case, an incident later settled as a false arrest.) In the end, the publicity aroused sympathy for Alcor and cryonics, even among mainstream people who were not interested in cryopreservation for themselves. Alcor's membership dramatically increased. Moreover, cryonics was legitimized in California, making that state the first jurisdiction where "cryonic suspension" has been recognized by name in state regulatory documents as a permissible disposition method.[51] (Cryonics has not been challenged elsewhere in the U.S.) There still is no licensing anywhere, as far as I know, specifically to practice cryonics. But donors (patients) can be received as anatomical gifts, and cryonics organizations can be duly qualified for that, so the court contests legitimized what had been going on all along.

Two special patients. The cryopreservations of Dora Kent and Robert Binkowski provoked lengthy and costly legal confrontations which, however, ultimately strengthened Alcor and cryonics.

Changes of Leadership

Mike Darwin replaced Laurence Gale as Alcor president in September 1982 as noted, with the end of Soma and the merger with IABS.[26] Darwin in turn was succeeded by Carlos Mondragon in February 1988, in the throes of the Dora Kent crisis.[34]



Mike Darwin[35]

Carlos Mondragón[36]

1990s

There were more tumultuous events in this decade, though mercifully not (quite) so harrowing as the legal struggles before.

The Passing of Jerry Leaf

Jerry Leaf, a heavy smoker, arrested at age fifty in July 1991 from a coronary attack and became a patient. His departure left a power vacuum that caused a split in Alcor, and the formation of a second organization, CryoCare (not to be confused with Cryo-Care Equipment Corporation, a much earlier organization based in Phoenix, Arizona that manufactured horizontal capsules for human cryogenic storage in the 1960s. The more recent CryoCare was located in Rancho Cucamonga, California).

Leaf's organization Cryovita passed into other hands and became part of the cryobiology research company, 21st Century Medicine, Inc. Alcor has since been more self-contained, still contracting with special-purpose service providers and research companies, but always maintaining staff and equipment capable of performing all aspects of cryonics itself (see below).[21,52]

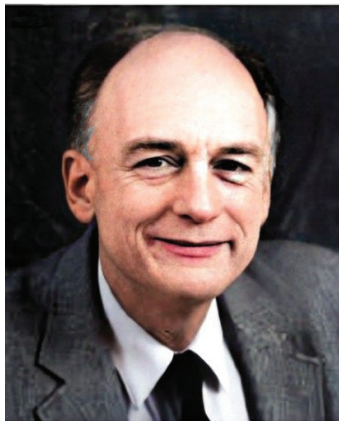
Patient Care Trust[32]

The need for a fund to protect those in cryopreservation was recognized very early, especially in view of early failures to maintain patients at other organizations.[31] Originally Alcor had a Patient Care Fund that was part of its own assets. By late 1991, this fund approached one million dollars and was by far the largest segment of Alcor's assets. The Alcor Board realized that a better way was needed to protect this money. For one thing, it was a possible "deep pocket" in any potential lawsuit against any part of Alcor's operation. For another thing, there was the potential temptation to use the fund for other purposes during tight financial times. So the idea was born to create a legally separate Trust to shield the fund from either of these possibilities. The idea was finalized in 1997 with the creation of the Patient Care Trust (PCT), but improvements were still desired, resulting much later (2016) in creation of the Alcor Care Trust Supporting Organization (ACT). More about this to follow.

Changes of Leadership[21]

Stephen Bridge became president Jan. 1993. Fred Chamberlain (again) became president Feb. 1997.

Steve Bridge[37]



Fred Chamberlain[38]

Move to Arizona[33,41]

Alcor's Board of Directors had been looking to move Alcor out of the Riverside facility for several years. We had outgrown the building not long after moving into it in 1987 with two full-time staff and with six patients. By early 1993, we had seven full-time staff and 27 patients. Additionally, in late 1992, as part of the Conditional Use Permit issued by the City of Riverside, we were forced to swallow a "poison pill" of a ban on animal research. In the beginning of 1993, we discovered that building-code mandated changes to the building and grounds might cost us as much as $50,000 to perform.

Combine this with the growing awareness of the earthquake damage risk in Riverside, which is in an especially vulnerable position near the San Andreas Fault, and the answer was clear: get out of town. Over the past couple of years, one of the places we had looked at most closely was Scottsdale, Arizona, near Phoenix. The central valley in Arizona has very low seismic risk, and animal research was permitted in the Scottsdale Airpark, a high-tech development in one of the most desirable areas of Maricopa County. Further discussion with Scottsdale's Planning and Development Department resulted in a statement from the city that cryonics was also compatible with the Airpark's I-1 zoning.

(Actually, Riverside is on *three* major earthquake fault lines: the San Andreas, the San Jacinto, and the Elsinore.[59]) The move occurred (the main part, including the patients in their containers) Feb. 21, 1994. David Pizer deserves credit for finding the location which was both suitable to Alcor's needs and could be affordably purchased.[21]

David Pizer in 2014[60,21]

Companion Newsletter

The Alcor Phoenix was a companion newsletter to *Cryonics* issued by Alcor over the years 1994-1999. At this time *Cryonics* was a quarterly publication, and the Phoenix, with its inexpensive format and fewer pages appeared during the intervening months. Eventually, however, the need for the extra publication was questioned:

The Alcor Phoenix was born to more directly involve the Members in the issues and occasional battles with which the staff and directors were then confronted. After publishing two separate information sources for five years, an analysis of the benefits versus the cost and personnel requirements has made us reevaluate the need for separate publications.[42]

As a consequence, the Phoenix was absorbed into *Cryonics* so again Alcor had only a single (still quarterly) newsletter.

BioTransport

BioTransport was an ambitious initiative started by Fred Chamberlain in the late 1990s after he became Alcor's president. It appears that its purpose was to be an organization separate from Alcor that would assist with standby, stabilization and transport (SST), vital preliminary steps in cryopreserving a patient, and eventually, perhaps, handle all of Alcor's needs in this area. In a 1999 article Fred writes:[43]

In order to expand our rescue capability, BioTransport's work will involve systems development of self-contained vehicular rescue facilities (highly automated labs in eighteen wheel semitrailers, like the MRI units that circulate from hospital to hospital), as well as smaller mobile units.

The tasks will require technical backgrounds and practical skills, with emphasis on electronics and mechanical design. Those who have worked in emergency medicine (EMTs and Paramedics) will have a decided edge.

BioTransport's expansion of programs will be gradual, but its business plan indicates that in six years, operating expenses will exceed two million dollars/year. Opinions differ on this being unrealistically high. Regardless, our plans call for growth, and growth is what we'll pursue. That means more and more people.

2000s

Vitrification Arrives

Vitrification ("glassification") is a method of cryopreserving tissue that avoids the formation of ice crystals thus greatly reducing damage as the tissue is cooled to cryogenic temperature. (For this reason it is distinct from "freezing" though the temperature is just as low.) Traditionally, cryonics patients had been preserved with some cryoprotection that reduced the extent of ice crystal damage but did not eliminate it. (They were frozen but not vitrified.) By 2000 however, an improved protocol had been developed under which, under good conditions, the ice crystals were avoided. Initially it could only be applied to head-only (neuro) patients, which is reflected in Fred Chamberlain's remarks (Cryonics 4Q 2000):[44]

Effective immediately, neuropatients will no longer be frozen by the Alcor Life Extension Foundation. This does not mean that Alcor is closing down! Rather, Alcor will now use a method of preservation that has never before been used in cryonics. Specifically, Alcor will now vitrify neuropatients instead of freezing them.

Chalky appearance of frozen rabbit kidney (left) contrasts with fresh appearance of vitrified kidney (right) in which ice formation, with its damage to cells, has been prevented.[46]

Healing the Breach

We noted how, following the cryopreservation of Jerry Leaf, a group within Alcor broke away and formed another cryonics organization, CryoCare. As the years went by, however, the animosities and divisions died down and, by the early 2000s, most of the CryoCare members had returned to Alcor (with patients also transferred) and the rival organization had effectively ceased to function.[21]

Cells4Life and the Chamberlains' Ordeal

Fred Chamberlain's efforts with BioTransport soon ran into a snag: not enough funding was available or could be raised for his ambitious program. He then proposed to create a subsidiary organization, Cells4Life, which would offer cryogenic cell storage services to the general public. Financial success with this venture could support the planned activities of BioTransport. Unfortunately, this too proved elusive. The Chamberlains ended up filing for bankruptcy, and also leaving Alcor for a while. The saga is briefly recounted in a Wikipedia biography, including details not previously reported:[45]

In 1993, concerned that Alcor was in danger of political chaos, Alcor employee Hugh Hixon persuaded the Chamberlains to become involved with Alcor's activities and in the fall of that year, amidst much turmoil, Fred was elected as an Alcor Director, and the Chamberlains accompanied Alcor in its move to Scottsdale, Arizona. In February 1997, Steve Bridge resigned as President of Alcor, and the Chamberlains offered to devote themselves to Alcor full-time. Fred became Alcor President and Linda became the Suspension Manager (the person responsible for application of cryopreservation protocol).

Alcor was in a difficult position when the Chamberlains came on board, as to maintaining pace with technology advances and paying for its staff at the same time. A Life Membership program was initiated, and a supporting corporation was formed by Linda to take over the responsibilities for cryopreservation services (BioTransport, Inc.), following the patterns established earlier by Manrise Corporation, Trans Time, Inc., and Cryovita Corporation (Jerry Leaf's start-up cryonics provider organization). Many difficulties in raising capital and finding the right mix of people led to the subsidiary for cell storage (Cells4Life, Inc.), and failure to raise capital finally forced both corporations into a defunct state.

The Chamberlains had signed for all of the unsecured debt and leases of equipment in both of these corporations (BioTransport, Inc. and Cells4Life, Inc.). In the collapse of these and in the context of an unresolved dispute with Alcor over reimbursement of BioTransport, Inc. for expenses incurred in launching Alcor's vitrification program, the Chamberlains liquidated their life insurance policies for cryonics arrangements and finally had to file bankruptcy. The circumstances of Linda's forced resignation as President of Alcor only a few months after assuming this role, together with their failure to resolve financial matters with Alcor as mentioned above, finally led to the Chamberlains joining the Cryonics Institute (CI) in July 2002, but they went back to being Alcor Members in March, 2011.

Suspended Animation, Inc.[48,56]

As events with BioTransport were running their course, Alcor management decided to use another, newly-formed company, Suspended Animation, Inc. (SA), for the needed standby, stabilization and transport services, a relationship that continues today. Quoting from the SA website:

Suspended Animation, Inc (SA) was founded in 2002 in Boynton Beach, FL. SA's purpose is to preserve bodies immediately after legal death to minimize the damages that occur before the body is cryopreserved. SA does not actually perform final cryopreservation, rather, they work with companies such as Alcor Life Extension Foundation and Cryonics Institute which carry out the cryopreservations and maintain the patients in long-term storage. Unlike Alcor Life Extension Foundation and Cryonics Institute, Suspended Animation, Inc does not offer memberships, but rather gains revenue from performing standby and stabilization procedures.

Alcor Life Extension Foundation also offers options for patients to use Suspended Animation, Inc in coordination with their procedures. Suspended Animation, Inc. provides all standby/stabilization/transport services for terminal Alcor Members outside Arizona, but inside the continental United States. Alcor provides those services for terminal Alcor Members in Canada, Arizona, and Hawaii.

Ted Williams Case[29]

The case of the famous baseball slugger happened in July 2002. It engendered controversy mainly due to the controversial nature of cryonics itself, which led to dissatisfaction on the part of some fans and certain family members and other acquaintances who were unhappy that the procedure was carried out. The case was originally confidential, but Alcor was required in court proceedings to make available to relatives a "document of gift" establishing the donation of the patient's anatomical remains to Alcor. A book was written about the incident, coauthored by a former employee of Alcor, which contained some inaccurate statements later retracted (see next section).

Board Members No Longer Staff Members[52,58]

The current Bylaws (and all earlier versions as far as I know) do not restrict cryopreservation members in good standing from being on the Board of Directors: Any person who has completed all legal and financial arrangements with the corporation for the postmortem cryopreservation of his or her remains in good standing with the corporation may serve as a Director of this corporation.[14] As late as 2004, a staff member could be a board member.[61] Since that date, however, it has been an unwritten policy that staff members do not serve on the Board, the feeling being to minimize possible conflicts of interest and weakening of management authority.

Comprehensive Member Standby (CMS)[53,54]

In the Jan.-Feb. 2005 *Cryonics* an article by then marketing director Jennifer Chapman introduces a new Alcor service:

Comprehensive Member Standby (CMS) is Alcor's newest advancement towards improved cryopreservations. Under CMS, all Alcor Members in the US and Canada are eligible to receive a Standby at no additional charge at the time of an emergency, regardless of whether a cryopreservation takes place. CMS also offers a $5,000 reimbursement to any terminally ill Member with a prognosis of 90 days or less who relocates to the greater Phoenix, Arizona area.

Alcor's website further elaborates:

CMS covers not only the "standby" phase of a cryopreservation, but also the "stabilization and transport" phase — in short, everything up until the patient is received at the Alcor facility. CMS monies are maintained in a separate fund that can be drawn on as needed so the cost to members is relatively fixed even though actual expenses for these procedures can vary by large amounts from one case to another.

Standby is a critical, and often costly, phase of the cryopreservation process. During a standby, time is of the essence. A team of highly-trained personnel is stationed near the Alcor member in need. Response personnel are outfitted with the necessary medications and equipment and stand ready 24 hours a day so they can stabilize the patient immediately after pronouncement. The team responds in an expeditious manner, very similar to the response expected for a person who donates his or her organs for transplant.

Currently Alcor Members can exercise various options, detailed at Alcor's website, to meet or mitigate the added cost of CMS.[57]

Whole-Body Vitrification[47]

A new cryoprotectant developed by medical organ banking researchers, M22, made it possible to attempt vitrification of an entire body so cephalic isolation (with the head perfused separately) was no longer necessary. (Before this, those who wanted whole-body preservation without cephalic isolation would have to accept perfusion with glycerol, an older method that did not achieve full vitrification.) The first whole-body vitrification perfusion occurred at Alcor in August 2005 and the new procedure then became routine.

Changes of Leadership[21]

The decade was notable for the number of different people who headed Alcor. After Fred Chamberlain, here are the names of those who took command, with dates: Linda Chamberlain (Apr. 2001), Jerry Lemler (Sep. 2001), Joe Waynick (Jan. 2004), Steve Van Sickle (Aug. 2005), Tanya Jones (Jun. 2008), Jennifer Chapman (Jan. 2009).

From left: Linda Chamberlain,[38] *Dr. Jerry Lemler (MD),*[21] *Joe Waynick*[55]

From left: Steve Van Sickle,[40] *Tanya Jones,*[39] *Jennifer Chapman*[39]

2010s

Another Change of Leadership[21]

Max More became president of Alcor in Jan. 2011, and would continue in office until early the next decade, for a total of nine years, a record tenure.

Larry Johnson and Scott Baldyga

In 2009 a book was published by Vanguard Press: *Frozen: My Journey into the World of Cryonics, Deception, and Death* by Larry Johnson with Scott Baldyga. Johnson, a former Alcor employee, claimed the remains of Ted Williams were mishandled during cryopreservation, despite Johnson's not being present at the time, and in other ways provoked a lawsuit from Alcor, which resulted in a retraction and apology by Johnson in February 2012. Quoting from the Alcor website:[49]

Max More (temporarily) occupies container of type used to store cryonics patients at Alcor, 2011.[15]

In 2009 Alcor sued authors Larry Johnson, Scott Baldyga, and publisher Vanguard Press in New York for their book Frozen, which purported to be about Alcor. The lawsuit was filed to obtain damages for the false and defamatory content of the book, to enforce prior court orders and agreements which publication of the book directly violated, and to protect the privacy of Alcor members. Bankruptcy papers filed by Johnson end Alcor's ability to collect damages related to this lawsuit from Mr. Johnson, unless there is a subsequent violation of terms by Mr. Johnson. All court orders remain in force to prevent future violations.

Johnson in turn issued this public statement:

When the book *Frozen* was written, I believed my conclusions to be correct. However, information unknown to me and a more complete understanding of the facts furnished by ALCOR contradict part of my account and some of my conclusions. In light of this new information from ALCOR, some parts of the book are questioned as to veracity.

For example my account of the Ted Williams cryopreservation, which was not based upon my first-hand observation as noted in my book, is contradicted by information furnished by ALCOR. I am not now certain that Ted Williams' body was treated disrespectfully, or that any procedures were performed without authorization or conducted poorly.

To the extent my recollections and conclusions were erroneous, and those recollections and errors caused harm I apologize.

Patient Care Trust Update

As we noted earlier, the Patient Care Trust (PCT) was created to insulate funds used to maintain patients in cryogenic storage from the usual operations and pressures/temptations of Alcor. In this way certain risks were greatly reduced, yet a need was felt for additional security. Quoting from the Alcor website:[32]

Over the years as the PCT funds grew ever larger, Alcor's leaders began to look for a way to separate the PCT further from its Alcor corporate existence and to provide the Trust with its own tax ID number. Two attorneys we asked about this advised us that it was extremely unlikely that the IRS would approve that kind of separation without lengthy and expensive court proceedings. They also felt that the PCT, still being part of Alcor, was not as secure from outside lawsuits as it could be. However, they did have experience with the IRS approving trusts which took the form of a Type 2 Supporting Organization, which could have its own separate existence, tax ID number, and 501(c)(3) tax status.

Fortunately we had set up the PCT to include the ability "to form any other separate legal entities to hold title to the assets of the Trust in order to carry out the substantive provisions of this Agreement." And of course, Alcor always has the right to set up other entities. Creating the ACT also turned out to be much easier said than done, and the process ended up taking more than three years.

The Alcor Care Trust Supporting Organization (ACT) was created on June 6, 2016 and approved by the IRS as a tax-exempt 501(c)(3) organization on June 20, 2017. Once that was successfully completed, the Alcor Board of Directors, the Trustees of the PCT, and the Trustees of the ACT worked carefully to put together an ACT Operating Agreement that details the relationship between the three entities. This was unanimously approved by all three Boards on October 11, 2017. Finally, on March 21, 2018, over $12 million in funds were transferred from the PCT investment account at Morgan Stanley Smith Barney, LLC, to a new ACT account also held at Morgan Stanley.

The primary function of the ACT is to hold the Patient Care investment funds and to invest them in such a way as to allow them to grow at the fastest rate that is consistent with a low level of risk. The strategy used is the same as that which was pursued by the PCT Trustees.

International Cryomedicine Experts (ICE)[62]

ICE was founded by Aaron Drake and colleagues around September 2017. Its purpose is much like Suspended Animation, Inc: to provide cryonics services for those who desire cryopreservation after legal death. Like SA, ICE does not do long-term cryogenic storage but only prepares the patient for cryogenic cooling. SA operates within the continental U.S. while ICE, as its title suggests, offers services in other countries. Alcor currently uses both for cases outside its resident state of Arizona; within the state its in-house team is normally used for all services.

2020 and Beyond[21]

In May 2020 Patrick Harris replaced Max More as Alcor's CEO. A long-contemplated change was then made: Alcor changed its state of incorporation from California, where it had been since its founding in 1972, to Arizona, where it had physically resided since 1994. This was not a trivial move, but was undertaken for definite, perceived advantages. Essentially, Alcor had to be dissolved in one state and reincorporated in another. As one consequence an updated (2021) version of the Bylaws was created; the purposes of Alcor are listed as follows:[50]

(a) to promote, foster, and conduct basic and applied research in all areas of the life extension sciences including, but not limited to, cryonics, cryobiology, gerontology, molecular engineering, and cell repair technology;

(b) to engage in the application of whole-body cryonic suspension, neuropreservation, and other postmortem and biopreservation techniques and to provide these services to the general public;

(c) to promote, encourage, further, and carry out research to develop techniques for shortterm and long-term fully reversible arrest of metabolism in man and other mammals, i.e., the development of suspended animation;

(d) to promote, encourage, further and conduct research to allow for repair, recovery, and rehabilitation of humans placed in cryonic suspension, neuropreservation, or other biopreservation techniques;

(e) to act as a bank or storage facility for tissues, organs, and all other human remains as may be required to further the purposes of (a) through (d) above pursuant to the Revised Arizona Uniform Anatomical Gift Act (Arizona Revised Statutes § 36-841, et seq. and as it may be amended from time to time), and any other statutes in any jurisdiction in which the corporation is registered;

(f) to engage in the dissemination and administration of techniques and information for extending human life span, health and quality of life;

(g) to act as a trustee, conservator, guardian, executor, power of attorney or medical surrogate as may be required to further the purposes above;

Patrick Harris, Current CEO of Alcor[15]

(h) to sponsor seminars, exhibits, workshops, displays and other activities to educate the general public about the life extension sciences in general and cryonics in particular; and (i) to provide financial support, research facilities, equipment and supplies required to carry out all the above objectives.

Concluding Remarks

We have surveyed the 50-year history of Alcor, a time that has witnessed many difficulties and dangers to the organization, as well as triumphs and progress. Its people have been tough and tenacious and have always carried the organization through. We are not perfect. But we are in it for the long haul, we have always been in it for the long haul. Our continued patience and perseverance offer the best hopes of realization for the noble purpose for which the organization was started: the eventual revival of those we cryopreserve. ■

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Fight Aging!

Reports From the Front Line in the Fight Against Aging

Reported by Reason

Fight Aging! exists to help ensure that initiatives with a good shot at greatly extending healthy human longevity become well known, supported, and accepted throughout the world. To this end, Fight Aging! publishes material intended to publicize, educate, and raise awareness of progress in longevity science, as well as the potential offered by future research. These are activities that form a vital step on the road towards far healthier, far longer lives for all.

Questioning the Reproducibility of Fly Life Span Studies

September, 2021

In the course of examining gender differences on fly longevity, researchers here find sizable variations in life span between repeated studies. This variation is thought to derive from differences in maintaining a fly population, such as the dietary composition and season of the year. They suggest that this calls into question the detailed data obtained from much of the work involving aging and age-slowing interventions in flies. Reproducibility is critical to establishing whether or not observed effects are real. Flies may thus be a poor choice of model organism for any initial investigation of means to slow or reverse aging.

While our original goal was to understand how genetic variation played a role in costs of reproduction, we discovered strong cohort effects from one study to the next, especially across years. While we did not interrogate environmental and husbandry effects during the course of this experiment, we can surmise that these two factors were the major drivers of the differences we saw between the two replicate experiments, as genetic backgrounds mostly consisted of iso-female lines.

The largest discrepancies between two years were seen with regards to maximum lifespans. While median lifespans were not changed to a large degree between years/seasons, maximum lifespans were significantly longer in summer 2019 in both sexes. We have several hypotheses, all related to fly husbandry, that could potentially explain this discrepancy. Our most likely, and anecdotally supported, hypothesis is that flies living in the summer are able to maintain better water homeostasis than those in the winter. Even though the incubators were set to approximately 60% humidity, we know that these often fluctuate. A second hypothesis for our observations is that the two experiments were done on slightly different media. As fly diet can have a huge impact on health and longevity, this could be contributing to our observed differences.

This lack of reproducibility in significant results between our two cohorts suggests that for certain questions the use of iso-female strains for determining genes that affect different phenotypes will require exquisite attention to husbandry details. The Drosophila Genetics Reference Panel (DGRP) has been used over the past decade to measure dozens of different biological phenotypes with conclusions about the genes playing a causal role in the phenotypes in question. However, if small environmental perturbations can make such differences in something as fundamental as sex differences in longevity, it is possible that many phenotypes may be more sensitive to subtle environmental variation than is generally supposed. As the fruit fly is used as the primary model organism to test novel compounds for their lifespan-extending effect, our results suggest that reproducibility between and even within laboratories might prove difficult.

Link: https://doi.org/10.1098/rsos.210273

Extra Thymi and Lesser Thymic Involution with Age in Long-Lived Naked Mole-Rats

October, 2021

Naked mole-rats show little decline of function until late life, are highly resistant to cancer, and live nine times longer than similarly sized rodent species. An important aspect of immune system aging in mammals is the atrophy of the thymus. Thymocytes created in the bone marrow migrate to the thymus where they mature into T cells of the adaptive immune system. As active thymic tissue is replaced with fat, in the process of thymic involution, this supply of T cells declines. Absent reinforcements, the T cell population of the body becomes ever more damaged, malfunctioning, exhausted, and senescent. Researchers here

show that not only do naked mole-rats have much delayed thymic involution, but they also exhibit the presence of multiple thymi.

Here, we provide the first characterization of the naked mole rat (NMR) thymus. We discovered that naked mole rats have an additional pair of cervical thymi. This is an unexpected finding as mammals, including humans and mice, as a rule, have only one bilateral thymus. Cervical thymi can occasionally be detected in mice, but their frequency is rare and they have unilateral appearance. Similarly, rare ectopic cervical human thymi had been reported in children. In contrast, cervical thymi are a principal component of NMR ontogenesis. Interestingly, among vertebrates, chickens have seven, sharks five, and amphibians three thymi. It is tempting to speculate that the presence of additional thymi in the naked mole rat may contribute to prolonged maintenance of immune function during their lifespan.

We provide evidence for a delay of thymic involution in naked mole rats beyond the 1st decade of their lifespan. Age-associated marker expression and thymic cell composition remained at the level of neonates. The absence of thymic involution up to midlife is unprecedented in mammals. This would translate into similar or even slightly heightened thymic weights and cell counts for humans in their 30s.

Thymic involution decreases output of naive T cells and reduces the ability to mount protective responses against new antigens. In naked mole rats, we did not see thymic involution in animals older than 10 years old, while markers for thymic function and development, AIRE and FOXN1, were maintained at neonatal levels. Furthermore, the reduction of early T-cell progenitors accompanying age-related lymphoid decline did not manifest in naked mole rats, arguing that their intrinsic myeloid bias in the marrow does not predispose hematopoiesis toward less lymphoid commitment. However, naked mole rats are not immortal and do show frailty in old age. Therefore, an eventual decline in thymic cellularity and immune function is to be anticipated, albeit delayed as opposed to the lifelong steady decline in humans and mice.

Link: https://doi.org/10.1111/acel.13477

More Trials and Cost Effective Trials of Rejuvenation Therapies are Much Needed

October, 2021

It costs a great deal to run a reasonably sized clinical trial within the formal system of regulatory governance. If the goal is to make a compelling demonstration of effectiveness, then at the very least a larger-than-usual phase 2 trial is required. The cost of getting to that point is upwards of $15-20 million in industry, and still a substantial fraction of that for academic institutions that have much of the supporting infrastructure already in place. Yet groups like Lifespan.io can put together a less formally administered trial, one that will teach us almost as much about whether or not a given approach is efficacious, for less than $250,000.

Not enough of this sort of work is taking place. There are too few low-cost assessments carried out with the aim of generating good data that may otherwise never arise. Even just looking at senolytics, there are scores of age-related conditions that may be beneficially effected by the low-cost dasatinib and quercetin combination. Academia and industry have yet to even start on the assessment of senolytic treaments for more than three of four of those indications. Time is ticking. The world needs more organizations and collaborative projects like Lifespan.io and the RLE Group noted here, working to responsibly gather data to show whether the present range of promising approaches to the treatment of aging work or not.

Our another achievement is the plasmapheresis trial, which is pretty well-known in the community. We didn't expect to observe dramatic improvements in biomarkers that we would treat as promising, we just wanted to understand the logistics of the whole plasmapheresis process. Because you need to replace half of your plasma with the saline + albumin solution and this is not a simple and standard procedure. But we managed to calculate how many plasma you need to donate with each visit to the doctor and how many albumin you need to replace and we did this and surprisingly we have found some pretty interesting changes in the biomarkers of this gentleman. We have found, for instance and contrary to our expectations, that cholesterol goes both directions - bad LDL goes down and good HDL goes up, which is pretty interesting. Of course we have only two data points, so we cannot draw too many conclusions from that, but we have started a clinical trial aiming to compare plasmapheresis with albumin and without albumin, because the role of albumin of the whole procedure is an interesting question.

A few smaller things our group has achieved. We have tried various senolytics in our volunteers. Created a lentiviral vector for APO-A1 Milano gene delivery. And also a microbiome replacement experiment, because we have access to samples from soviet cosmonauts (who are usually considered exceptionally healthy, so our hypothesis is that transferring the microbiome could yield interesting health improvements).

Here are several things we are planning to deliver in the upcoming years. We are intrigued by the study showing muscular aging through 15-PGDH, and we want to reproduce it on ourselves. Another target is epigenetic rejuvenation of hematopoietic stem cell function via targeting Cdc42. This type of cell is very reluctant to different approaches in reversing aging (even our extracellular matrix one), so we plan to rejuvenate them and

investigate how to maintain the useful environment for these rejuvenated cells. The third thing is targeting elastogenesis. Elastin is now considered to be one of the longest living proteins in our body, elastogenesis is limited to early infancy and then the old synthesized elastin remains in our body, accumulates calcium, is degraded by enzymes and so on, therefore we lose elastin which leads to progressive deterioration of various tissues - blood vessels, skin, lungs, ligaments, muscles, ... All tissues lose their elasticity and that is crucial not only for appearance but also functional health. We can try - and already have some methods - to increase elastin production in vivo.

Link: https://foresight.org/salon/alexander-fedintsev-biohacking-a-necessary-component-of-a-strategy-for-radical-life-extension/

An Update on Revel Pharmaceuticals, Working on Glucosepane Cross Link Breakers

October, 2021

Revel Pharmaceuticals is the result of work funded in large part by the SENS Research Foundation, with the support of its many philanthropic donors. That part of the history of the underlying research isn't covered in this short article on the company, so it seems worth mentioning here. Cross-links are chemical bonds formed between molecules in the extracellular matrix. Some are necessary to structure and function, but other unwanted cross-links are added over the years, creating stiffness in flexible tissues such as blood vessel walls and skin. In the case of blood vessels, stiffness causes hypertension, and eventual mortality. Revel is aiming to remove cross-links based on glucosepane, which appear to be the dominant type of persistent pathological cross-linking in human tissues.

The field of glucosepane cross-link research is an excellent example of the way in which philanthropy is required to make progress. There was compelling evidence that such cross-links are likely important in the aging process, and yet next to no-one chose to work on the problem. This was a bootstrapping problem: because no-one had spent a good deal of time on glucosepane, the tools to work with it didn't exist. Worse, glucosepane isn't a factor in short-lived mammals, their important pathological cross-links are chemically different from those in humans, so animal models of such cross-linking were a distant prospect at best. Thus scientists, funding sources, and others all turned their attention to other projects in other fields, because those other projects promised a more rapid path to what the world at large considers useful outcomes. Next to no-one funded or worked in the field of glucosepane cross-linking precisely because next to no-one funded or worked in the field of glucosepane cross-linking research.

How was this problem resolved? The SENS Research Foundation, a non-profit, stepped in and used funds provided by donors to fund the work to produce the necessary tools for glucosepane cross-linking research, as well as projects that identified bacterial enzymes capable of breaking down glucosepane. That work was licensed out to Revel Pharmaceuticals, and one of the researchers involved is now heading the company in an effort to turn those enzymes into therapies. The point here is that philanthropy works. This is one of any number of similar efforts to unblock research and development undertaken by the SENS Research Foundation and Methuselah Foundation over the past twenty years. The outcome will hopefully lead to a proof of concept to demonstrate that glucosepane cross-linking is an important aspect of aging, and that in turn will shortly thereafter become an industry with as much promise as the present senolytics industry when it comes to human rejuvenation.

A new approach to reversing tissue aging

The formation of Revel Pharmaceuticals is a reimagination and expansion of targeting AGE crosslinks using enzymes rather than small molecules as the therapeutic. "Enzymes are biologics, so we can be very precise as we make modifications to repair damaged proteins and break up crosslinks."

"We're quite unique right now, in the aging space - not many companies are focused on the structural, protein side of aging. If you look at the literature and clinical data, it's very clear that damage and crosslinking of collagen and other proteins is a significant contributor to aging. As the structure of the extracellular matrix surrounding cells becomes crosslinked and degraded, proteins begin to aggregate and lose functionality, tissues become stiffer, and the immune system becomes activated leading to low level inflammation. We're looking at the same targets that have been of interest for a long time, but no one's had a good way to correct or repair them. We started out looking at glucosepane, the predominant crosslink in aging human tissue, but there are many other important aging crosslinks and damage products to which we've expanded our scope."

"Our work has led us to five or six interesting targets, which also serves to de-risk our pipeline, so all of our eggs aren't in one basket. What we have now is a suite of enzymes targeting a suite of different damage products." Revel is preparing to move therapeutic enzymes into pilot studies in animal models and human cadaver tissue from biobanks. "If we have 80 year old tissue that comes from a biobank, then the gold standard is really to show that, when we add our enzymes to that very old tissue, we can repair these modifications and correct the damage. Once that critical milestone is met for each enzyme, we will immediately push into animal studies and eventually clinical testing."

Link: https://www.longevity.technology/a-new-approach-to-reversing-tissue-aging/

Wanted: A Non-Profit to Run as Many Low-Cost Trials of Promising Treatments for Aging as Possible

October, 2021

A major gap exists in the present spectrum of efforts to develop the means to treat aging, rejuvenate the old, and turn back age-related conditions. On the one hand, a small number of promising potential therapies to treat the mechanisms of aging can at present be applied by physicians off-label, or otherwise without the need for a great deal of interaction with the FDA. On the other hand, there are a good hundred or more clinical indications, specific age-related conditions recognized by regulatory authorities, that might be improved by these therapies. Several hundred small, informal trials could be run, starting now, given approaches that presently exist, in order to determine whether or not these forms of therapy are in fact effective.

Let us only consider the senolytic combination of dasatinib and quercetin, for example, a low-cost treatment that can be given off-label and that has been demonstrated to clear senescent cells in human patients. Clearance of senescent cells in mice produces profound and rapid rejuvenation. Senolytics as a class of therapy are at present in human trials for only a few indications: osteoarthritis, idiopathic pulmonary fibrosis, COVID-19, chronic kidney disease, and recently Alzheimer's disease. The whole senolytic industry, and associated academic trial groups, after nearly ten years of development, has done no more than initiate a few formal human trials, at great expense, and which are very slow to answer the question of whether this actually works well. Senescent cells are involved in some way in nearly every age-related condition, disrupting tissue function throughout the body, provoking chronic inflammation. Effects on the full panoply of age-related conditions could be assessed. This is not being done.

If considering small informal trials, let us say that one aims for 100 to 200 people per trial, more than enough to produce meaningful evidence for efficacy when the effect size is significant. With volunteer efforts, cheap off-label treatments and low-cost assays for suitable endpoints, this sort of informal trial can be conducted for $200,000 - which is exactly what Lifespan.io is doing for their PEARL trial of mTOR inhibition. The model works. Even if the cost were $500,000 or $1,000,000, then that would still be vastly cheaper than the full, formal FDA IND process. A single non-profit with significant funding could run many such trials in a year, generating human evidence at a much greater rate than the scientific community and biotech industry combined are managing at the moment.

That evidence is much needed. There is an enormous amount of funding sitting on the sidelines. Funding that could be supporting the deployment of senolytic drugs to the population, or could be running large-scale formal clinical trials to validate the use of senolytics. The organizations capable of deploying that funding are very conservative. They will only start in on such a project after there is already proof, after the debate is already won. Which is why we need the results of many low-cost trials – in order to demonstrate that dasatinib and quercetin is a meaningful and useful approach to the treatment of aging.

Everything said above about the dasatinib and quercetin senolytic combination also applies to, say: fecal microbiota transplantation; or periodic blood plasma dilution; or the Khavinson peptides for thymic regrowth; or the Intervene Immune approach to thymic regrowth; or CASIN for CDC42 inhibition and restored immune function; or injection of stem cell derived exosomes; and so forth, into a growing list of approaches that may well be capable of achieving good results in old people. Many of these are already being used by self-experimenters, but that will never generate the sort of data that is convincing to the powers that be. There is tremendous potential to demonstrate benefits in older individuals via addressing one or more of the underlying mechanisms of aging, and the world is instead largely squandering time as the clock keeps ticking on all of our lives.

Finding Cautions in the Ease with which it is Possible to Create Epigenetic Clocks

November, 2021

In recent years, researchers have established that machine learning approaches can be used to produce any number of clocks from biological data that shifts with age, finding patterns that match chronological or biological age to a great enough accuracy to suggest that they can be useful assays for the assessment of potential age-slowing and rejuvenating therapies. It remains an open question as to whether and how exactly the assessed patterns correlate to the specific forms of molecular damage that cause aging, or to any of the specific downstream consequences of that damage. Scientists here raise the possibility that much of the epigenetic change of aging may not in fact be as useful as a basis for measurement as thought, and suggest that more fundamental research is required in order to robustly connect clocks with specific processes of aging.

Our meta-analysis of the largest available age-annotated methylation dataset to date found: 1) as much as one fifth of the measured cytosines contains age-predictive methylation patterns; 2) tissues show largely similar aging patterns despite having methylated regions that define their identity; 3) epigenetic clock sites are enriched in intergenic regions, gene enhancers, and sites near expression quantitative trait loci (eQTLs) and 4) are depleted in the regions generally thought to have the

largest direct impact upon gene expression (e.g., CpG Islands and gene promoters); 5) patients with age-correlated diseases did not appear significantly age-accelerated according to the chronological epigenetic clock.

The fact that many different sites can be used to create an epigenetic clock with minimal impact on predictive performance argues against the idea that methylation changes are either programmed or individually important. Yet, because the clock is robustly predictive and age-related methylation changes are mostly similar between tissues, this argues against entropy as a driving force. This could be reconciled by hypothesizing some genomic regions and/or features receive less methylation maintenance than others.

Perhaps the changes occur in regions of the genome where they have no consequence, and instead, vary with absolute time such as in determining speciation time using pseudogene mutation rates. This "pseudomethylation" would be problematic for modeling aging biology, as they would likely not respond to aging intervention. Methylation maintenance mechanisms (e.g., DNMT1) serve as a counterbalance against entropy. However, if some genomic regions are less maintained than others, then we would expect the probability of a methylation state change with age to be correlated with the degree to which it is subject to methylation surveillance and maintenance. Because maintenance costs energy, it is reasonable to hypothesize the degree of maintenance correlates with the adverse impact an unregulated change in methylation would cause. If so, the probability a site's methylation will vary with age would inversely correlate with its impact on an organism's survival.

Given that methylation changes with age are robust across tissues, yet small in magnitude, leads the field to question whether the "ticking" that drives them is due to changes in cell population composition, such as a reduction of pluripotent stem cells or an increase in senescent cells within every tissue, or possibly high magnitude effects in rare cell populations (e.g., immune cells in the central nervous system compared to astrocytes or neurons). In either case, it is not clear whether the phenomenon driving ticking clock sites is due to healthy compensatory changes or deleterious drift toward age-related fragility.

In summary, the predictive power of the epigenetic clock is robust, but such a large fraction of the genome can be used to predict, the magnitude of the changes is small, and these regions tend to be depleted near genes. This leads us to hypothesize that the pan-tissue predictive loci are more likely to be molecularly "silent" methylation changes that accrue outside of strong regulatory regions due to entropy in methylation maintenance, which must be explored in the future studies. Furthermore, if current models inconsistently annotate patients with age-related diseases as "age-accelerated" and the confidence by which one can declare a sample age-accelerated is small, this argues against the idea that epigenetic clocks can disentangle biological age from chronological age.

Link: https://doi.org/10.1111/acel.13492

Present Calorie Restriction Mimetics are a Poor Substitute for the Practice of Calorie Restriction

November, 2021

The portion of the medical research and development community that is focused on aging spends most of its time and funding on classes of treatment that cannot outperform good lifestyle choices when it comes to improving health and slowing degenerative aging. Why is this? If billions and decades are to be expended on building a pipeline from fundamental research through to clinical trials, why is the goal only an incremental benefit to health, smaller than that produced by regular exercise, intermittent fasting, or the practice of calorie restriction? Why such a lack of ambition, given the many possible projects that could achieve far more?

The small patient advocacy community focused on the treatment of aging as a medical condition spent long years convincing scientific and industry groups that it is both possible and desirable to extend the healthy human life span. The result of that work is, it appears, largely the initiation of projects that simply don't matter in the bigger picture, that won't meaningfully change the shape of later life, that won't greatly extend healthy human life spans.

The following research materials are a reminder that the lion's share of effort and investment in the longevity industry is devoted to treatments and potential treatments that upregulate cellular stress responses, such as autophagy, to recreate a thin fraction of the natural metabolic outcomes of exercise, fasting, hypoxia, or calorie restriction. It remains the case that far too little attention is given to work that can in principle produce rejuvenation, by repairing the molecular damage that is the underlying cause of aging. Yes, senolytic therapies to clear senescent cells have made the leap, but senolytics see a fraction of the interest given to calorie restriction mimetics.

This is an important topic for continued patient advocacy. It is clearly not enough to convince the institutions of the world to work towards the treatment of aging; that is an important and ongoing battle, but it is only a first step. We must also advocate for a focus on the right sort of research programs, those that are in principle capable of producing sizable gains in health and life span, versus those that are not. If another two decades slip away with nothing to show for it but the clinical approval of varieties

of mTOR inhibitor and other calorie restriction mimetic small molecule drugs, then a great opportunity to improve the human condition and save countless lives will have been squandered.

Diet trumps drugs for anti ageing and good metabolic health

A study comparing the impact of diet versus drugs on the inner workings of our cells has found nutrition has a much stronger impact. The pre-clinical study suggests the makeup of our diet could be more powerful than drugs in keeping conditions like diabetes, stroke, and heart disease at bay. Conducted in mice, the research showed nutrition (including overall calories and macronutrient balance) had a greater impact on ageing and metabolic health than three drugs commonly used to treat diabetes and slow down ageing: metformin, resveratrol, and rapamycin.

The research builds on the team's pioneering work in mice and humans demonstrating the protective role of diet and specific combinations of proteins, fats, and carbohydrates against ageing, obesity, heart disease, immune dysfunction, and risk of metabolic diseases, such as type 2 diabetes. Drugs can also target the same biochemical pathways as nutrients. There has been a huge effort to discover drugs aimed at improving metabolic health and ageing without requiring a change in diet. "We discovered dietary composition had a far more powerful effect than drugs, which largely dampened responses to diet rather than reshaped them."

Nutritional reprogramming of mouse liver proteome is dampened by metformin, resveratrol, and rapamycin

Nutrient sensing pathways influence metabolic health and aging, offering the possibility that diet might be used therapeutically, alone or with drugs targeting these pathways. We used the Geometric Framework for Nutrition to study interactive and comparative effects of diet and drugs on the hepatic proteome in mice across 40 dietary treatments differing in macronutrient ratios, energy density, and drug treatment (metformin, rapamycin, resveratrol). There was a strong negative correlation between dietary energy and the spliceosome and a strong positive correlation between dietary protein and mitochondria, generating oxidative stress at high protein intake. Metformin, rapamycin, and resveratrol had lesser effects than and dampened responses to diet. Rapamycin and metformin reduced mitochondrial responses to dietary protein while the effects of carbohydrates and fat were downregulated by resveratrol. Dietary composition has a powerful impact on the hepatic proteome, not just on metabolic pathways but fundamental processes such as mitochondrial function and RNA splicing.

NeuroD1 Gene Therapy for Neural Regeneration Looks Like a Dead End

December, 2021

In recent years, researchers have produced what looked like promising results in reprogramming supporting cells in the brain into neurons via neuroD1 gene therapy. A way to do this, to produce new neurons that can integrate into existing neural circuits, would provide a road to regeneration of the brain. Unfortunately, and as sometimes happens, this may all be a dead end, and the early promise was based on misinterpretation of the data. This will likely be hashed out further in the next few years; science often proceeds in this way, and this is one of the many reasons as to why independent replication is vital to scientific progress.

In 2019, researchers in Japan published breakthrough results detailing how NeuroD1, a protein involved in cell differentiation, could coax microglia into new neurons. Now, researchers in China have found that not only does NeuroD1 not induce microglia-to-neuron conversion, but also that the protein induces microglia death. The team set out to investigate the molecular mechanisms underpinning the original finding, since microglia and neurons descend from different cellular lineages.

The researchers applied a rigid lineage tracing protocol to follow the cellular differentiation progression in mice, as well as to monitor the effect of lentiviral vectors - an inert virus package used to carry NeuroD1 to the central nervous system - on the process. They validated their observations through live cell imaging and pharmacological approaches. "Disappointingly, our results do not support the 'microglia-to-neuron conversion. Instead, our data strongly indicate that the previously observed conversion was actually due to the experimental artifacts from viral leakage."

The assumed finding was likely due to NeuroD1's actual role: triggering microglial cell death. Neurons are unaffected by NeuroD1 so their numbers will stay the same, while microglia cell numbers decrease. However, due to the low purity of the microglia and the viral leakage, it could appear that while microglia cells were decreasing, non-microglia cells were increasing, leading to the conclusion in vitro that microglia were converting to neurons.

"The 'microglia-to-neuron' conversion should be verified following three principles: 1) unambiguous microglial-based lineage tracing and lack of lentiviral leakage, along with well-designed controls; 2) unambiguous live cell imaging to show how an individual microglial cell converts to a neuron; and 3) upon microglial depletion, there should be no or few microglia-converted neurons." The last point appeared to be supported in the original paper, but when researchers replicated the experiment, they found that even when 98.9% of microglia cells

were killed, numerous "microglia-converted neurons" were still observed. Such a finding suggests that the converted neurons were mislabeled cells rather than the desired neurons.

Link: https://www.eurekalert.org/news-releases/936970

Cataract Surgery Correlates with Reduced Risk of Dementia

December, 2021

The following research materials report on a solid correlation between cataract surgery to restore vision and lower risk of later dementia. This provides support for the view that a reduced flow of sensory information to the brain accelerates the onset of neurodegeneration and loss of function with age. This is quite distinct from the usual set of underlying biochemical processes that are investigated in connection with cognitive decline and dementia: the accumulation of molecular waste in the brain; the chronic inflammation of brain tissue; the loss of mitochondrial function; the dysfunction of the vascular system leading to lesser delivery of oxygen and nutrients to an energy-hungry tissue; and so forth. In addition to all of these, laid atop the foundation of a failing biology, there is good evidence for a "use it or lose it" view of the aging brain.

In the past, researchers have found correlation between age-related retinal degeneration (and consequent vision loss) and dementia, and between and age-related deafness and dementia. There is considerable discussion in the research community regarding the causes of the latter association. Is it that brain networks thrive on input, and deafness reduces that input, or is it that common processes of aging damage both the brain and the sensory hair cells of the inner ear? Looking at the surgical reversal of cataracts sidesteps the question of common age-related mechanisms, and supports the view that there is a causal relationship between lack of input to the brain and the pace of progression towards neurodegeneration and loss of cognitive function.

Study: Cataract surgery linked with lessened dementia risk

The Adult Changes in Thought (ACT) study is a long-standing, Seattle-based observational study of more than 5,000 participants older than 65. Based on the longitudinal data of over 3,000 ACT study participants, researchers have now found that subjects who underwent cataract surgery had nearly 30% lower risk of developing dementia from any cause compared with those who did not. This lowered risk persisted for at least a decade after surgery. Cataract surgery was also associated with lower risk of Alzheimer disease dementia specifically. The mechanisms by which cataract surgery and lessened dementia risk are associated was not determined in this study. Researchers hypothesize that people may be getting higher quality sensory input after cataract surgery, which might have a beneficial effect in reducing the risk of dementia.

Association Between Cataract Extraction and Development of Dementia

Twenty percent of adults older than 65 years in the United States experience significant sensory impairment, such as vision or hearing loss, even with correction. Addressing sensory loss that affects a substantial portion of older adults may be a potentially modifiable risk factor for dementia in late life. Because sensory impairments and dementia are both strongly associated with aging, more knowledge about the association between sensory impairment and dementia may have important implications for individual and global public health, particularly if interventions to improve sensory function reduce dementia risk.

Visual impairment is an important dementia risk. Cataract is a leading cause of blindness worldwide, affecting more than 35 million people globally and causing blindness in approximately 20 million. Cataract affects most older adults at risk of dementia. However, there are conflicting results regarding the association between cataract extraction and cognitive impairment or dementia.

We hypothesized that older adults with cataract who undergo cataract extraction may have a lower risk of developing dementia compared with participants who do not undergo cataract surgery or participants who undergo other eye procedures that do not restore vision, such as glaucoma surgery. Previous studies exploring this association have been limited by small sample sizes, cross-sectional designs, and varying qualities of dementia assessment. More importantly, these studies have failed to account for healthy patient bias (i.e. when surgery is more likely in healthier individuals with the same cataract severity).

In total, 3038 participants were included, with mean age at first cataract diagnosis of 74.4 years. Based on 23,554 person-years of follow-up, cataract extraction was associated with significantly reduced risk (hazard ratio, 0.71) of dementia compared with participants without surgery after controlling for years of education, self-reported White race, and smoking history and stratifying by apolipoprotein E genotype, sex, and age group at cataract diagnosis. Similar results were obtained in marginal structural models after adjusting for an extensive list of potential confounders. Glaucoma surgery did not have a significant association with dementia risk. Similar results were found with the development of Alzheimer's disease dementia.

A Trial of Proprietary Epigenetic Age Assessments, With No Other Attached Health Data, Provides No Value

December, 2021

You'll recall that a collection of research groups and companies are working to assess the benefits of alpha-ketoglutarate supplementation. The results reported to date focus exclusively on outcomes in epigenetic age assessment, using a proprietary clock algorithm that is not yet open to inspection or analysis. The open access paper I'll point out here is the formal publication of the results announced earlier this year. Since no other information on patient outcomes beyond epigenetic age is provided - such as, for example, measures of inflammation, immune health, and so forth - this data is essentially of no value whatsoever. The earlier mouse studies were more informative! We cannot even speculate as to what this particular epigenetic clock is measuring. Not that we could do much better given the clock algorithm, once it is published: it is presently impossible to make more than sketchy reasoned guesses at what fully described epigenetic clocks such as GrimAge are actually measuring.

Since epigenetic clocks are discovered in epigenetic data via machine learning processes, at present no-one knows how or why the identified characteristic epigenetic changes arise with age. Thus no-one can guess in advance as to how a specific epigenetic clock will react to any given intervention that affects only a subset of the processes of aging. To be useful as a means of rapidly assessing whether or not a given intervention is actually producing rejuvenation, an epigenetic clock must be first calibrated against that intervention by running life span studies in mice. Alternatively it must be established as to exactly how these epigenetic marks relate to underlying processes and consequences of aging. The former is an easier task, but still an expensive one.

Cynically, it is clear that people in the marketing-dependent supplement space are going to skip the question of understanding in favor of simply shopping for large numbers. They are going to run different clocks against all of the cheap, low-yield approaches known to upregulate cellular stress responses or reduce inflammation and publicize the largest reduction in epigenetic age regardless of the merits of the approach and the clock. There will be a lot of this sort of thing going on in parallel to more responsible work that is focused on gathering enough data to start to say something useful about how these epigenetic clocks work. The mark of a responsible study is, I think, the presence of a lot of other comparison data from study participants, such as measures of frailty, inflammation, and other markers of aging and age-related disease. That is clearly not the case in this paper.

Rejuvant, a potential life-extending compound formulation with alpha-ketoglutarate and vitamins, conferred an average 8 year reduction in biological aging, after an average of 7 months of use, in the TruAge DNA methylation test

The epigenetic clock is an attractive biomarker of aging because it applies to most human tissues, capturing aspects of biological age such as frailty, cognitive/physical fitness in the elderly, age-acceleration in obesity, and lifetime stress. Markers of biological aging represent an important tool to clinically validate the effects of longevity-based interventions. For the first time, these biomarkers of aging give scientists the opportunity to study the effects of anti-aging compounds in real-time and directly in humans. We utilized the TruAge prediction model with Sanger sequencing for DNA methylation analysis. In total, 3 genes including 9 CpG sites were analyzed by the Sanger sequencing. The DNA methylation values obtained for all CpG sites were included in the TruMe age-prediction model (pending publication).

Alpha-ketoglutarate (AKG) is an endogenous intermediary metabolite in the Krebs cycle whose levels naturally decline during aging. AKG is involved in multiple metabolic and cellular pathways. These include functioning as a signaling molecule, energy donor, precursor in the amino acid biosynthesis, and a regulator of epigenetic processes and cellular signaling via protein binding. AKG deficiency in stem cells and progenitor cells increases with age. As animals age, mitochondrial function is progressively impaired and cellular metabolic flux in the mitochondria declines, which exacerbates AKG deficiency. It was reported that AKG increased the lifespan of C. elegans.

Building on these results, AKG (and calcium salt) combined with other Generally Recognized as Safe (GRAS) compounds were studied in mice. The non-genetically altered mouse is the preferred mammalian model to study aging, since the biochemical processes involved in mice aging may apply to other mammals, including humans. In a recent study, sponsored by Ponce de Leon Health and performed at the Buck Institute for Research on Aging, the effect of alpha-ketoglutarate (delivered in the form of a calcium salt - CaAKG) on healthspan and lifespan in C57BL/6 mice was reported. The authors showed that in the mice, AKG reduced frailty and enhanced longevity, indicating a compression of morbidity. These and other discoveries suggest that AKG may be an ideal candidate for pro-longevity human studies.

Herein we report a retrospective analysis of DNA methylation age in 42 individuals taking Rejuvant, an alpha-ketoglutarate based formulation, for an average period of 7 months. DNA methylation testing was performed at baseline and by the end of treatment with Rejuvant supplementation. Remarkably, individuals showed an average decrease in biological aging of 8 years using the TruMe age-prediction model. Furthermore, the supplementation with Rejuvant is robust to individual differences, as indicated by the fact that a large majority of participants decreased their biological age. Moreover, we

found that Rejuvant is of additional benefit to chronologically and biologically older individuals. While continued testing, particularly in a placebo-controlled design, is required, the nearly 8-year reversal in the biological age of individuals taking Rejuvant for 4 to 10 months is noteworthy, making the natural product cocktail an intriguing candidate to affect human aging.

Senolytic Treatment Improves Muscle Regeneration in Old Mice Only

December, 2021

Senescent cells accumulate with age. Researchers here provide evidence for yet another age-related decline to be added to the long list of issues in which this accumulation of senescent cells is an important contributing cause. In this case, the problem is the loss of regenerative capacity in muscle tissue that occurs with age. Can this be due to loss of stem cell activity? Past research has indicated that muscle stem cell populations are largely intact in old individuals, but increasingly quiescent and inactive. Removing senescent cells removes some portion of the inflammatory signaling characteristic of old age, and this signaling may be influential in the loss of stem cell function in many tissue types.

Equally, the loss of regenerative capacity may have more to do with changes in the timing of clearance of senescent cells during the process of tissue regrowth following injury. The immune system becomes less able to rapidly clear senescent cells in later life. There has been some concern that intermittent removal of senescent cells via senolytic treatment would impair wound healing, given that the short-term presence of senescent cells is involved in the intricate coordination of different cell types that is needed for regeneration. As this study shows, the benefits of removing senescent cells in this way outweigh the downsides, at least in the old mice. In young mice, removal of senescent cells is disruptive to wound healing.

The evidence here suggests that issues in aged muscle regeneration are caused in part by (a) the inability of the immune system to rapidly clear the senescent cells created during the healing process, and (b) senescent immune cells that enter the injured area. The aged environment may be forcing immune cells into senescence rather than allowing them to perform the usual pro-regenerative activities.

Deletion of SA β-Gal+ cells using senolytics improves muscle regeneration in old mice

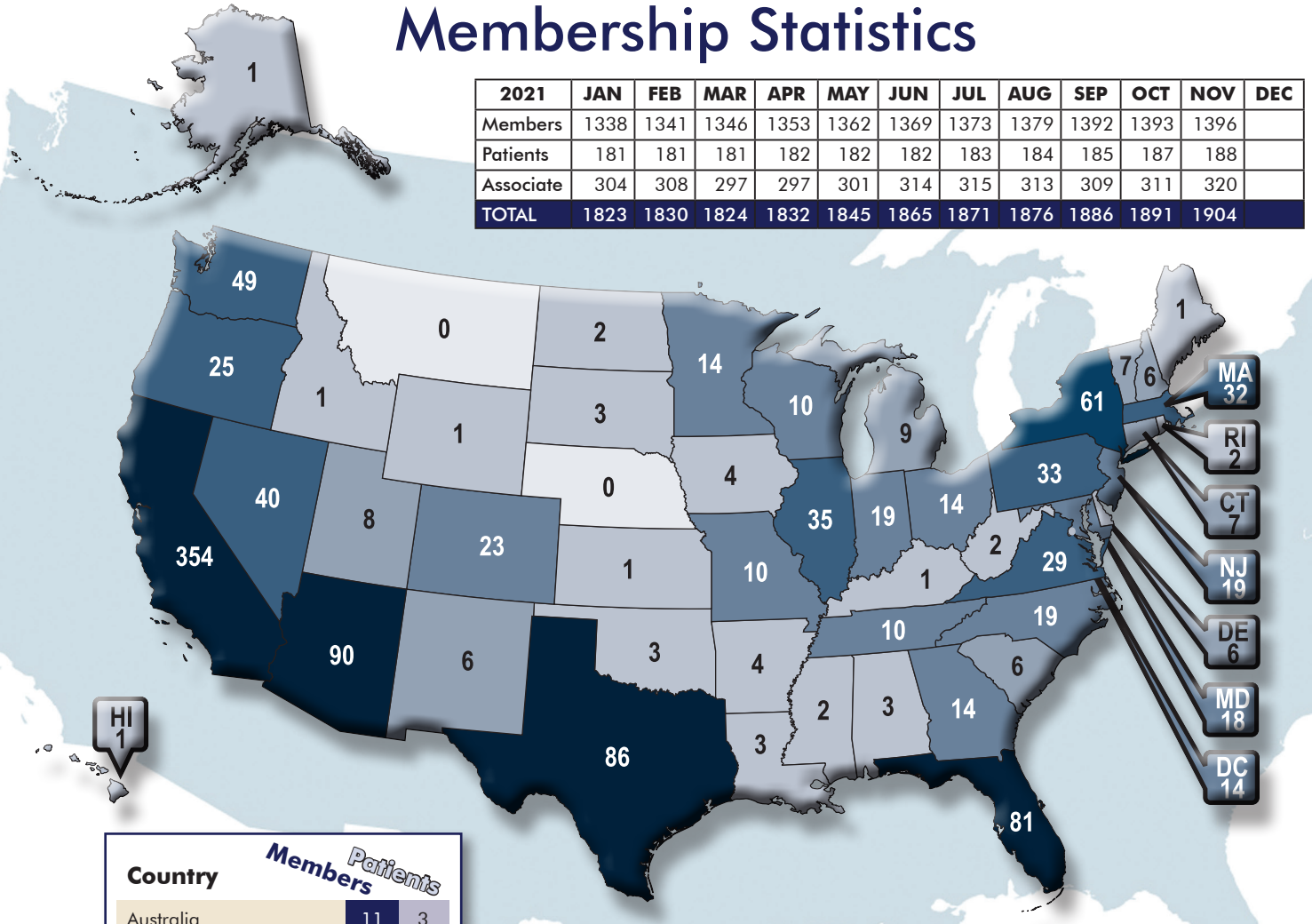
Systemic deletion of senescent cells leads to robust improvements in cognitive, cardiovascular, and whole-body metabolism, but their role in tissue reparative processes is incompletely understood. We hypothesized that senolytic drugs would enhance regeneration in aged skeletal muscle. Young (3 months) and old (20 months) male C57Bl/6J mice were administered the senolytics dasatinib (5 mg/kg) and quercetin (50 mg/kg) or vehicle bi-weekly for 4 months. Tibialis anterior (TA) was then injected with 1.2% BaCl2 or PBS 7 days or 28 days prior to euthanization. Senescence-associated β-Galactosidase positive (SA β-Gal+) cell abundance was low in muscle from both young and old mice and increased similarly 7 days following injury in both age groups, with no effect of D+Q. Most SA β-Gal+ cells were also CD11b+ in young and old mice 7 days and 14 days following injury, suggesting they are infiltrating immune cells.

By 14 days, SA β-Gal+/CD11b+ cells from old mice expressed senescence genes, whereas those from young mice expressed higher levels of genes characteristic of anti-inflammatory macrophages. SA β-Gal+ cells remained elevated in old compared to young mice 28 days following injury, which were reduced by D+Q only in the old mice. In D+Q-treated old mice, muscle regenerated following injury to a greater extent compared to vehicle-treated old mice, having larger fiber cross-sectional area after 28 days. Conversely, D+Q blunted regeneration in young mice. In vitro experiments suggested D+Q directly improve myogenic progenitor cell proliferation. Enhanced physical function and improved muscle regeneration demonstrate that senolytics have beneficial effects only in old mice.

Send email to Reason at Fight Aging!: reason@fightaging.org

Membership Statistics

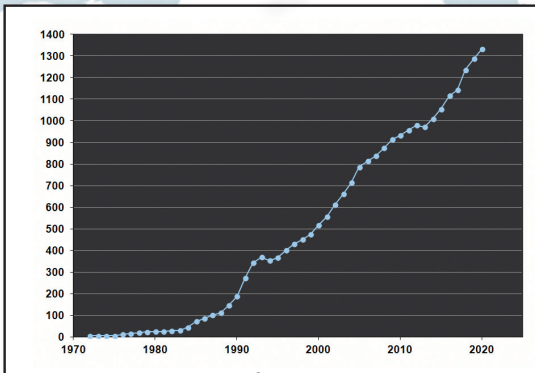
2021	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Members	1338	1341	1346	1353	1362	1369	1373	1379	1392	1393	1396	
Patients	181	181	181	182	182	182	183	184	185	187	188	
Associate	304	308	297	297	301	314	315	313	309	311	320	
TOTAL	1823	1830	1824	1832	1845	1865	1871	1876	1886	1891	1904	



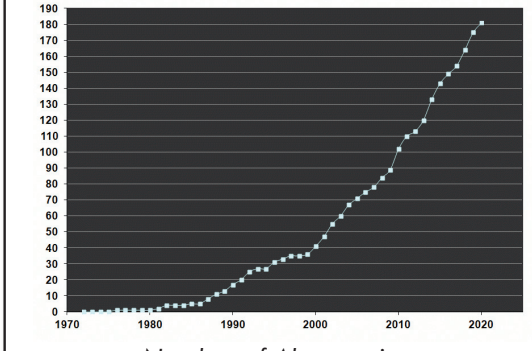
International Members & Patients

Country	Members	Patients
Australia	11	3
Austria	1	0
Belgium	1	0
Brazil	1	0
Bulgaria	1	0
Canada	77	5
China	0	1
Croatia	2	0
Finland	2	0
France	3	1
Germany	19	0
Hong Kong	2	0
Hungary	1	0
Israel	1	1
Italy	1	0
Japan	6	0
Luxembourg	1	0
Mexico	5	0
Monaco	1	0
Netherlands	1	0
New Zealand	1	0
Norway	2	0
Portugal	4	1
Puerto Rico	3	0
Slovenia	1	0
Spain	5	1
Sweden	1	0
Switzerland	3	0
Taiwan	1	0
Thailand	3	1
United Kingdom	42	3
Virgin Islands	1	0
TOTAL	204	17

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



Number of Alcor members



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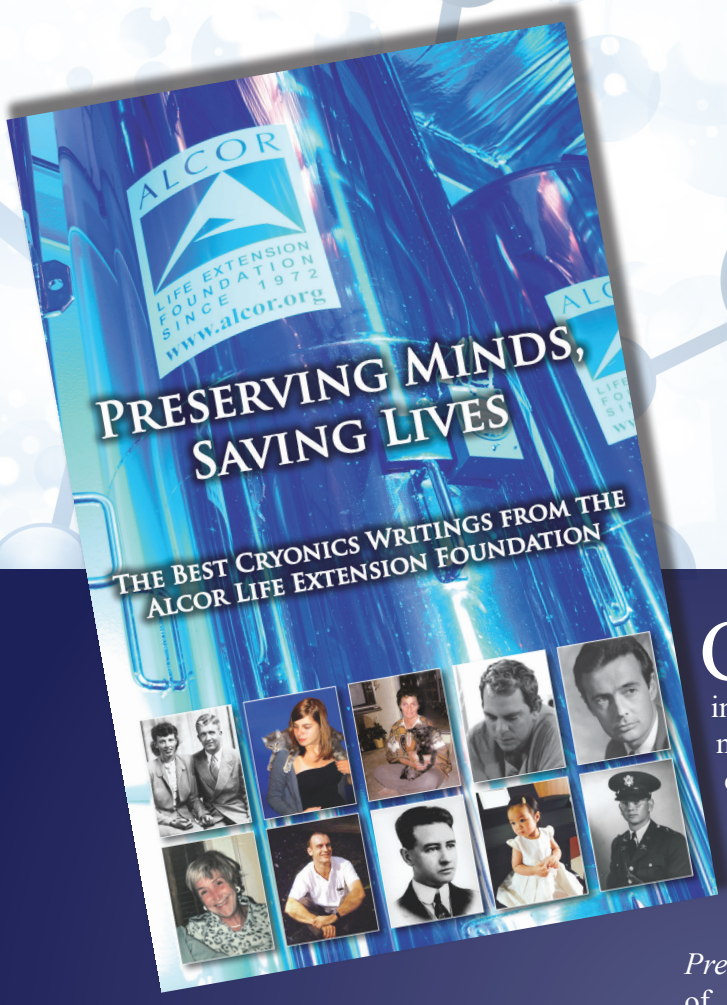

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– Max More, Ph.D.
Ambassador and President Emeritus of Alcor

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How do I find out more?

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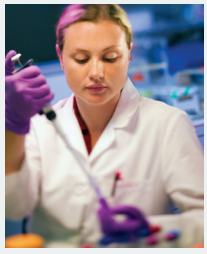

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