

Increasing Human Longevity Through Bioengineering with *Transcranial Radiofrequency Waves*



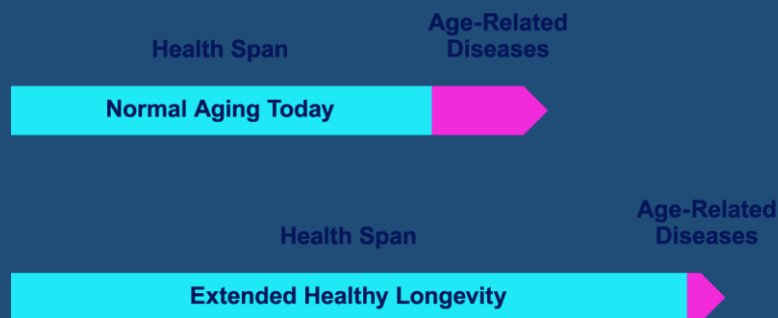
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**UNIVERSITY OF
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RF 
LONGEVITY

Living Decades Longer

Most of us would dearly want to live decades longer and in good health if given the opportunity – in other words, we would wish to increase our “health span” to 100 years or more. Sadly, there are no gerotherapeutic drugs that have been shown to extend human health span and no clinical trials have begun with the primary endpoint being to extend healthy human lifespan.



Rather than multiple therapeutics/drugs, it is highly desirable to have a single intervention to prevent/lessen many diseases of aging. Such an intervention would then automatically increase health

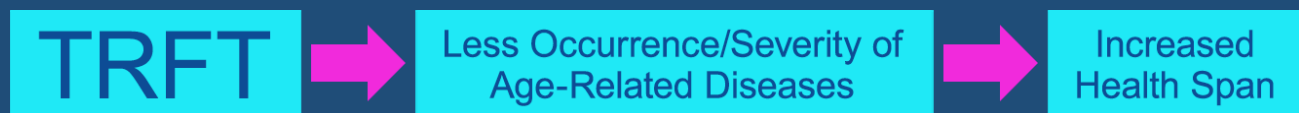
span, resulting in a much shorter period of age-related diseases at the end of life (see Figure). Based on the current state of gerotherapeutic research, the most promising intervention to extend healthy longevity is not a drug or combination therein, but rather a single bioengineered device to administer a new technology to the human head – **Transcranial Radiofrequency Waves**.

Why Transcranial Radiofrequency Wave Treatment (TRFT) to extend human life span?

- 1) TRFT has already been clinically shown to stop and reverse the cognitive decline of Alzheimer’s Disease (a major disease of aging) in small studies
- 2) TRFT was given the first “Breakthrough” device designation by FDA against Alzheimer’s Disease
- 3) TRFT treatment over a 2½ year period resulted in no development of any new age-related diseases in aged Alzheimer’s patients
- 4) TRFT has been shown to be safe (no known side effects) over years of treatment
- 5) TRFT is administered in-home through a bioengineered device (the MemorEM) that is self-contained, silent, and painless
- 6) TRFT has multiple mechanisms of action that target many diseases of aging to likely increase “healthy” longevity. A primary mechanism of TRFT is to re-balance the immune system, which then dramatically decreases inflammation in both

body and brain. All of the diseases of aging listed below involve inflammation and are thus potentially targeted by TRFT:

Alzheimer's Disease	Cardiovascular Disease	Diabetes
Brain Cancer	Infections (Viral/Bacteria)	Rheumatoid Arthritis
Multiple Sclerosis	FTL Dementia	Lymphomas
Chronic Kidney Disease	Body Cancers (e.g., lung)	Peripheral Neuropathy
Arterial Hypertension	Amyotrophic Lat. Sclerosis	Chronic Pain
Parkinson's Disease	Irritable Bowel Disease	LATE Dementia



Meet Dr. Arendash

- The neuroscientist who developed TRFT
- Over 135 peer-reviewed scientific publications
- Professor Emeritus, Dept. of Molecular Biosciences
University of South Florida
- Eight clinical papers demonstrating:
 - The safety and ability of TRFT to stop & reverse AD cognitive decline
 - The potential for TRFT to extend human longevity through multiple mechanisms
 - The ability of TRFT to increase toxin drainage out of the human brain
 - The potential for TRFT to induce brain tumor regression
- Founded NeuroEM Therapeutics, Inc., scientifically advancing the Company to a position for continued clinical trials
- Initiated RF Longevity SE to extend knowledge of TRFT and to continue clinical trials of TRFT in Alzheimer's Disease, while extending those trials to other neurodegenerative diseases and to increase human longevity
- Attained the first "Breakthrough" device designation by FDA against Alzheimer's Disease with TRFT (the MemorEM device)



Why RF Longevity?

Through **RF Longevity**, Dr. Arendash has recently begun focusing his scientific and awareness efforts to expedite clinical trials/use of TRFT to increase “healthy” human longevity and to prevent/treat diseases of aging –most notably, Alzheimer’s Disease.

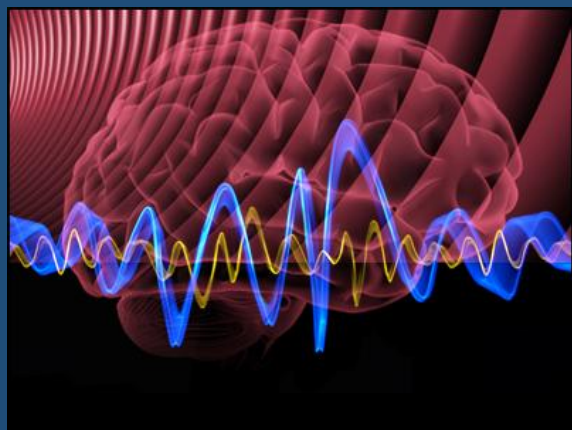
The MemorEM Device

TRFT involves the generation of electromagnetic waves in the radiofrequency (RF) range by an electromagnetic wave generator. These RF waves radiate away from emitters on the head, never to return. In the MemorEM device, such RF waves are generated by a small EMF generator worn on the arm, which is connected via wires to multiple emitters within a double-layered cap. This unique device provides the first-ever radiofrequency treatment to the entire human forebrain. The device is fully self-contained and allows for near complete in-home mobility during daily one hour treatments. RF waves appear to be completely safe for humans at current and future power levels for TRFT devices.



Published Clinical TRFT Studies

Dr. Arendash’s clinical work into longevity has primarily targeted one major disease of aging (Alzheimer’s Disease), and through multiple mechanisms that should successfully prevent/lessen many diseases of aging. AD robs individuals of their memory over a 2-10 year period, generally starting after 65 years of age.



One in three Americans dies with AD, while seven million currently have AD and another 6-10 million have the prelude to AD called Mild Cognitive Impairment (MCI). Unfortunately, there remains no drug that can prevent, stop/stabilize, or reverse AD’s cognitive decline. A brief description of the published clinical work that Dr. Arendash and his collaborators have done that is changing this tragic AD narrative is presented below:

- **TRFT is the only AD therapeutic that has been shown to reverse AD cognitive decline in clinical trials.** TRFT was administered to AD subjects daily in-home for 2-months. Both ADAS-cog13 and Rey AVLT performance were dramatically improved after 2 months, and to the better cognition level these subjects would have had one year earlier [Arendash et al., 2019]
- **TRFT is the only AD therapeutic that has been shown to stop the progressive cognitive decline in AD subjects over a long, protracted period (2½ years).** TRFT was administered daily over a 31 month period. Along with six individual cognitive tasks, a *Cognitive Composite* showing “overall cognitive performance” combined eight cognitive measures from the six tasks, including ADAS-cog. No cognitive decline occurred over the 2½ year period for any measure individually or in the Cognitive Composite, indicating TRFT had stopped the progression of AD cognitive loss over a long period [Arendash et al., 2022]
- **TRFT beneficially decreases major AD markers in the brain, such as p-tau and Aβ oligomers.** These two toxic proteins appear to be the main culprits that cause AD within neurons. No other therapeutic can get inside neurons to substantially decrease both of these oligomers, which is a major reason that TRFT stops and reverses AD cognitive impairment [Arendash et al., 2019; Arendash et al., 2022]
- **TRFT increases “functional connectivity” of neurons within the brains of AD subjects evaluated by functional MRI (fMRI).** Functional connectivity within the AD brain typically decreases over time in fMRI imaging. In sharp contrast, increased fMRI signaling was observed in all AD subjects at several months into TRFT. Thus, TRFT actually increased communication of neurons with one another in the human brain [Arendash et al., 2019]
- **TRFT re-balances the immune system (cytokines) in both brain and body in AD subjects to dramatically decrease brain and body inflammation.** Inflammation is central to most diseases of aging, so TRFT should effectively target those diseases (see “TRFT Mechanisms” below) [Cao et al., 2022]

What’s Needed Now: **THE FIRST THERAPEUTIC LONGEVITY TRIALS IN HUMANS**

Specifically, longitudinal controlled clinical trials with TRFT in normal “aged” individuals to monitor occurrence of many diseases of ageing and the effect of TRFT on biologic age, cognition, inflammation, and healthy longevity.

TRFT's Multiple Mechanisms of Action

TRFT has four primary “disease-modifying” mechanisms of action that target many diseases of aging to likely increase human longevity [Arendash et al., 2023; 2024]

- 1) TRFT re-balances the body and brain's immune system
- 2) TRFT disaggregates toxic protein oligomers in the brain
- 3) TRFT enhances drainage of protein toxins from the brain
- 4) TRFT increases energy production in the brain



Mechanism 1: TRFT Re-balances the Body and Brain's Immune System

In humans, an imbalanced immune system occurs in later years, also known as “Inflamm-aging”. This imbalance is due to over-activation of the immune system's pro-inflammatory component over its anti-inflammatory component, as indexed by the immune system's effectors — “cytokines”. As indicated earlier, an imbalanced immune system is central to most diseases of aging.



In young adulthood and through middle age, the immune system's pro-inflammatory and anti-inflammatory cytokines are in balance, which limits inflammation in the brain and body.



This cytokine balance is lost in older age because of over-activation of pro-inflammatory cytokines. The imbalance induces a chronic level of inflammation in the brain and body – the primary cause of many diseases of aging

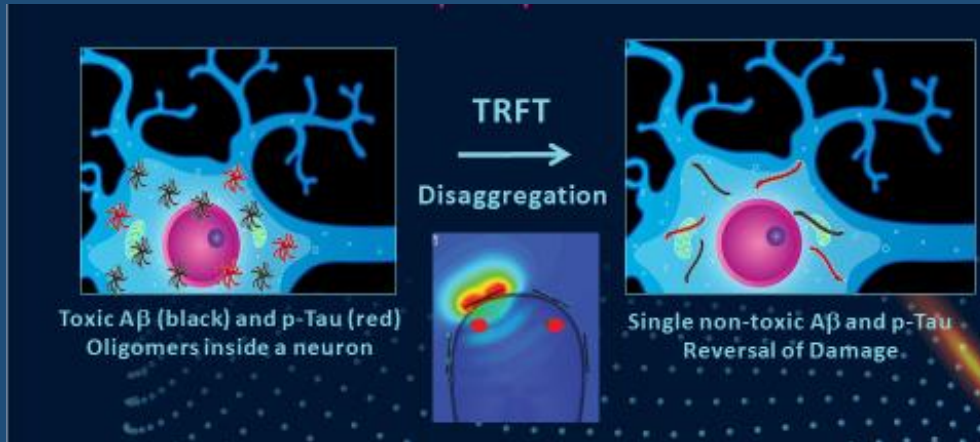


Many Centenarians (100+ years) have maintained a “balanced” immune system, with both robust pro-inflammatory and anti-inflammatory components to effectively provide them with health longevity.

An intervention that can maintain or re-establish immune system balance should result in an increase in lifespan with fewer age-related diseases occurring, as enjoyed by centenarians. There is only one such clinical intervention that has the capacity to “rebalance” the human immune system – TRFT. Such re-balancing of the immune system in blood results in dramatic decreases in blood/body inflammation. This same immune re-balancing and decrease in inflammation by TRFT is also seen in the human brain.

Mechanism 2: TRFT Disaggregates Toxic Protein Oligomers in the Brain

Small toxic aggregates of two proteins ($A\beta$ and p-Tau) increase in neurons during aging and much more so in AD (below figure, left). In AD, these toxic oligomers cause neurons to dysfunction, ultimately leading to their death.



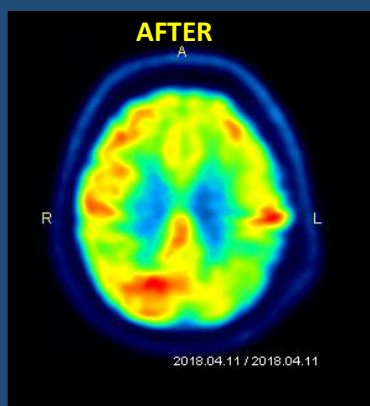
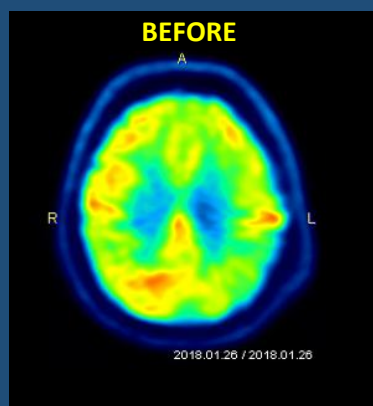
TRFT disaggregates BOTH of these toxic oligomers inside neurons into single (monomeric) proteins that are non-toxic (above figure, right). This results in a substantial decrease in these two toxic oligomers and ensuing reversal of the damage they cause. In addition to Alzheimer's Disease, there are a host of age-related neurologic conditions whose pathogenesis involves toxic protein oligomers – neurologic conditions that are all targeted by TRFT:

Mild Cog. Impairment	Parkinson's Disease	Amyotrophic Lateral Sclerosis
Huntington's Disease	Traumatic Brain Injury	FrontoTemporal Lobe Dementia
LATE Dementia	Lewy Body Disease	Cortico-Basal Dementia

Mechanism 3: TRFT Enhances Drainage of Protein Toxins from the Brain

The ability of the brain to remove brain toxins such as $A\beta$ and p-tau decreases with aging, especially in Alzheimer's Disease. Much of this toxin removal from the brain occurs through the brain's lymphatic vessels. In Alzheimer's patients, TRFT enhances this toxin removal by apparently dilating the brain's lymphatic vessels to increase lymphatic flow out of the brain. In essence, TRFT increases the "brain cleansing" (removal) of $A\beta$ and tau proteins from the brain and into plasma of Alzheimer's patients. So TRFT both disaggregates toxic $A\beta$ and p-tau proteins in the brain and then enhances their removal from the brain. This "one-two" punch likely contributed to TRFT's cognitive benefits in the same Alzheimer's subjects.

Mechanism 4: TRFT Increases Energy Production in the Brain

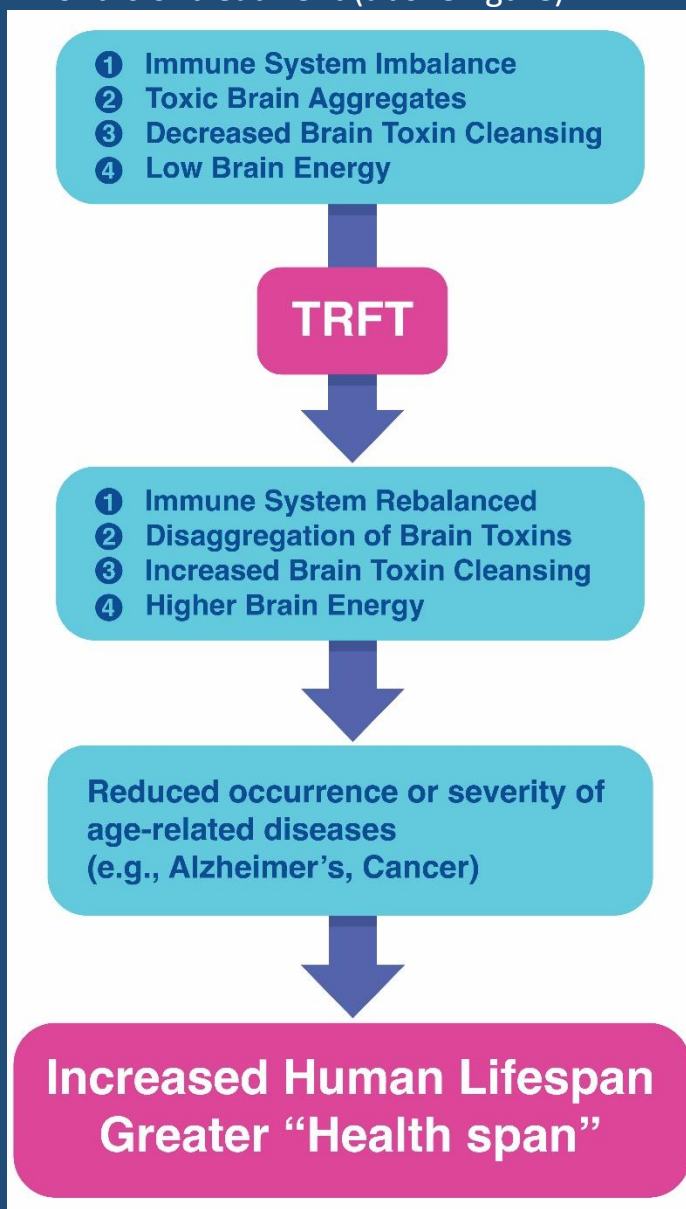


Initial indications that TRFT can increase the brain's energy production were attained from Dr. Arendash's pre-clinical studies wherein both aged AD mice and aged normal mice showed substantial TRFT-induced increases in brain energy production. As well, some human AD subjects

given TRFT showed a sizable enhancement in their cerebral metabolic rate, as indicated by FDG-PET scans taken before and after 2 months of treatment (above figure).

SUMMARY:

**Four Mechanisms of TRFT Act
to Likely Extend Human Health
Span**



Referenced Publications:

Arendash et al., *Journal of Alzheimer's Disease* Vol 71: 57-82 (2019)

Arendash et al., *Medicines*, Vol. 9, August 3 (2022)

Cao et al., *Frontiers in Aging Neuroscience*: 14, Article 829049 (2022)

Arendash et al., *International J. of Molecular Sciences* 24: 9652 (2023)

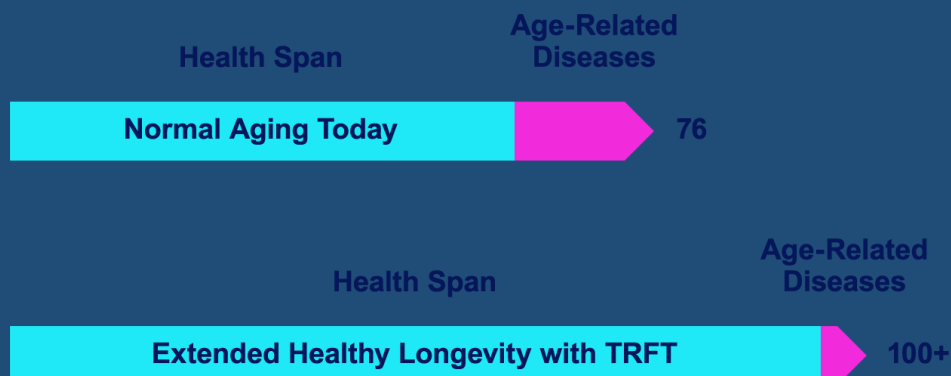
Arendash et al., *Journal of Alzheimer's Disease* 100100:S223-S241 (2024)

Collaborators



FINAL THOUGHTS:

TRFT is presently among the most promising interventions to increase human health/life span. The clinical work published by Dr. Arendash and his collaborators clearly warrants additional clinical trials to definitively evaluate the ability of TRFT to prevent/lessen diseases of aging and to thus increase human life span. Extending “healthy” human longevity to 100 years or more through this promising bioengineered technology is indeed realistic.





“The enigma of extending human longevity is best addressed by a single advanced technology that can target the many diseases that cause aging”

– Gary W. Arendash

