

TEN MAJOR INNOVATIONS IN AGING RESEARCH DURING THREE DECADES OF AFAR



photo: Joe de Sciose

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In the more than three decades since its founding, AFAR has been instrumental in building the body of knowledge that has developed the field of biomedical research on aging. With AFAR's support, science has led to innumerable discoveries that are bringing us closer to the development of therapies that will extend healthspan, or our years of health as we age.

To illustrate this, here are ten innovations that have transformed aging research, many of which are driven by AFAR experts.

- **SINGLE GENES CAN HAVE A DRAMATIC IMPACT ON THE RATE OF AGING.**
The significance of this discovery is that single genes provide feasible targets for drugs that modulate their activity, thus preventing disease.
- **SENESCENT CELLS DO HAVE A DAMAGING IMPACT AS WE AGE.**
These are cells that could once replicate to repair aging tissue but have now lost that capacity due to internal damage. It turns out that they degrade surrounding tissue by secreting harmful molecules. A long-time controversy has been whether senescent cells really had any damaging impact on us. We now know that they do—and why.
- **SENESCENT CELLS CAN BE REMOVED.**
Researchers have discovered methods to get rid of accumulating senescent cells. This has proven to have many beneficial effects on health in mice, such as preventing cancer and preserving heart and kidney function. We are now ready to translate this to humans.
- **YOUNG BLOOD HAS REJUVENATING PROPERTIES.**
Blood of young animals contains molecules that can actually rejuvenate damaged heart, brain, and muscle in older adult animals. Although the identity of these molecules is still uncertain, researchers are curious to learn if humans have similar molecular rejuvenation patterns, which could help prevent or delay disorders like dementia and heart failure.
- **EXERCISE CAN IMPROVE COGNITIVE HEALTH AS WE AGE.**
In addition to established benefits of preserving cardiovascular health, reducing body fat, and lowering blood sugar, we now also know that exercise slows age-related processes within our cells, which can benefit the brain.

- **RESTRICTING CERTAIN FOODS—WITHOUT RESTRICTING CALORIES—CAN INCREASE HEALTHSPAN.**

Research is showing that the restriction of certain food components, such as protein, or even just foods containing a certain amino acid, methionine, may preserve health without restricting calories themselves.

- **PREVENTING PROTEIN AGGREGATION CAN PRESERVE HEALTH.**

Aggregation of misfolded proteins has long been assumed to be involved in neurological diseases such as Alzheimer's disease, where these aggregates form the classic plaques and tangles. We now know that preventing such protein aggregation misfolding preserves health generally.

- **SIX DRUGS HAVE BEEN DISCOVERED THAT EXTEND LIFE IN MICE.**

This success rate is extraordinary, and affirms how deeply the field now understands the underlying biology of aging.

- **ONE OF THESE DRUGS, RAPAMYCIN, HAS REMARKABLE AGE-RELATED EFFECTS.**

In mice, rapamycin has been shown to delay the onset of Alzheimer's disease and even slow normal age-related memory decline, preserve heart function, prevent several types of cancer, and improve vaccine response in older adults. It has also shown to improve vaccine response in humans.

- **BIOLOGICAL PROCESSES OF AGING MAY DIFFER BETWEEN MEN AND WOMEN.**

Therapies that have proven successful at preserving health in mice are effective only in one sex: might human treatments to preserve health differ for men and women? Differences in longevity and healthspan between the sexes should be explored to help understand mechanisms underlying variation in longevity within a species.

What's next? Notably, the majority of these ten top discoveries has been found in laboratory animals: **it is now time to move these discoveries into human trials.**

The first such trial, the **TAME (Targeting Aging Through Metformin) study**, will test whether metformin—a drug currently prescribed as the first line of defense against Type II (adult onset) diabetes and already taken by millions of people—can delay the onset of age-related diseases.

Through AFAR's management, TAME is now in its planning stages and will open the door to more trials based on other promising drugs.



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