

Hacking Biology

DIY protocol to measure and address
the hallmark of aging

<https://hackingbiology.com>

The biological area of actions: Actual and potential

Box 1. List of hallmarks of aging described up to date.

Genomic instability GI (+)

Telomere attrition TA (+)

Epigenetic alterations EA (+)

Loss of proteostasis LP (+)

Deregulated nutrient-sensing DNS (+)

Mitochondrial dysfunction MitD (+)

Cellular senescence CS (+)

Stem cell exhaustion SCE (+)

Altered intercellular communication AIC (+)

Disabled macroautophagy DM (+)

Splicing dysregulation SD (-)

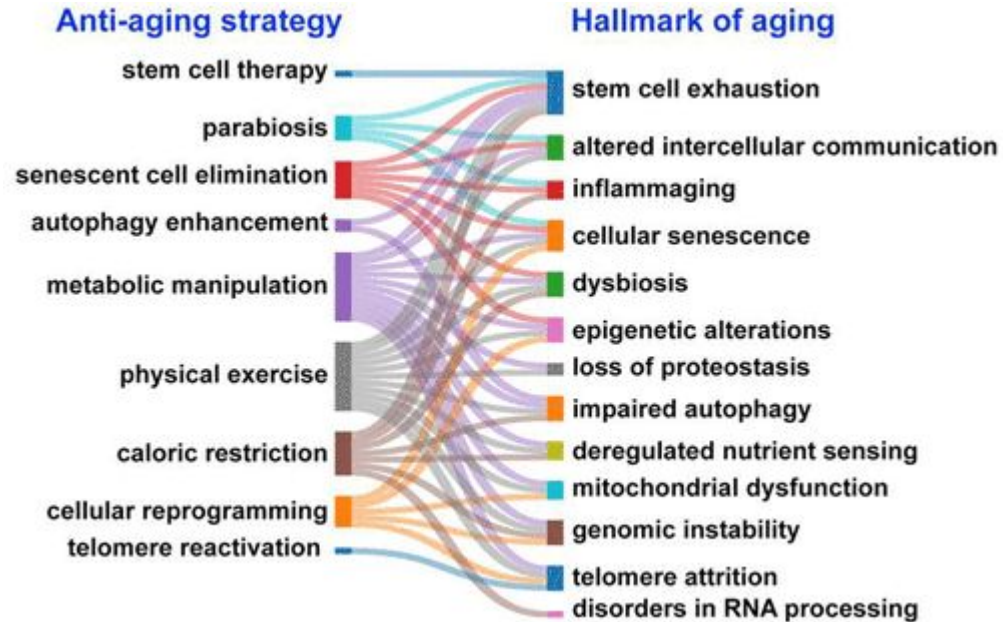
Chronic inflammation Inf (+)

Altered mechanical properties AMP (+)

Dysbiosis Dys (-)

Immunaging IA (+)

The hallmarks for which a known targeted life-prolonging therapy exists in mammals, are marked with (+) otherwise with (-).



Targeting multiple hallmarks of mammalian aging with combinations of interventions

Antiaging Strategies and Remedies

Biohacking Community Protocol and Measurement System

Let people choose their way, among a database of intervention that can compose a custom protocol, reporting back specific health KPIs to measure impact of anything new being done or drugs taken. Example from [rapamycin.news forum](https://rapamycin.news/forum)



Rapamycin raises my LDL and ApoB

rapamycin, blood-test, side-effect



DeStrider  member

3d

My LDL was 67 before I started Rapamycin. After I started, it went up to 120. I added Bempedoic Acid and Ezetemibe and it came back down to 67. I've since added 5 mg Atorvastatin and my LDL and ApoB are now 48.

Anti Aging - Motivation

I am 43; I know my body is changing with a slow functional loss and I do want to act on it.

Being a nerd, I found out there are a lot of research ready, but little comprehensive approach.

Very rich people can afford high level clinics providing services.

Companies provides pills to be taken with monthly subscription, focusing on one specific aspects of anti-aging: But there are many!

I start Hacking Biology project recognizing that the only valuable approach is to keep up to date with adopting all new scientific finding on aging slow-down and reverse, as they are found and deserve some testing.

Becoming an adopter of multiple approach to address different hallmark of aging, but by measuring in a structured and comparable way its effect on myself.

All in all, everyone buys anti-aging (as we know it's a commercially polluted sector) but no-one measuring in details its effectiveness.

I need to do an “applied research protocol” on myself with a DIY execution but with data sharing.

Project takes inspiration from Bryan Johnson, but aims to become an “open laboratory” that result in a “distributed trial” producing Data.

Providing that service to all the Biohacking and Longevity community to choose their protocol, get requested KPI to be measured and reported for trend analytics.

Machine learning will play well if we have thousands of subjects applying themselves the protocol, and sharing their data trough.

Anti Aging - Project Methodology

Aging is represented by multiple changes in our body at various biological levels.

Most levels can be measured by using specific “biomarkers”.

Methodology is simple as follow:

- Measure Biomarkers:
 - Record biological age and chronological age reference delta
- Act on Biomarkers:
 - Take Supplement, Therapeutics, Nutritions, Pharma to change it
- Measure effectiveness of actions taken on a public dashboard
 - Collaborative analysis of the results of own protocol specific parameters (OpenData)



Identify analytically effectiveness of the actions



Continuously experiment new research findings

Biomarkers Measurements Data Collection & Presentation

Measurement data input +130 biomarkers:

- Blood Panel (very wide, from Lipids up to NAD+)
- DNA (Methylation, Telomere length)

Measure frequently to collect more data:

- Blood panel monthly
- DNA Analytics
- Microbiome
- DEXA

Collect all data on a database:

- Load data uploading examinations data or typing input manually

Present the data:

- Display biological age and chronological age delta
- Measure data impact of new actions/therapeutics (whenever to maintain it or not)

Therapeutics Actions: From Supplements to Plasmapheresis

Therapeutics actions are many and among them very different:

- A lot of Supplements in pills
- Some pharmaceutical (Fabio Roadmap of Supplements and Pharmas)
- Peptide injections and extraordinary boost via IV blood infusion
- Plasmapheresis
- [HBOT Protocol](#) with alternated hypoxia-hyperoxia fluctuations (Dr. Shai Efrate / Aviv-Clinics)
- Lipidic control for Cardio Vascular diseases ([Peter Attia Protocol](#))
- Glicemic control with multiple T2D drugs (multi spectrum anti-aging effect)
- Some hormone regulation (ensure metabolic balance, for example DHEA)
- Nutrition habits (fasting 16/8 and/or calories restriction with target body fat)
- Gym and exercise practice

But what matters is on which Biomarker this action intervene for different goals:

- Maintain a healthy DNA with less damage and longer telomere
- Reduce and maintain an healthy level of senescence cells efficiently by triggering autophagy and apoptosis
- Take care of your Mitochondria:
 - Improve Mitophagy, respiration and reduce Fragmentation
- Ensure your hormonal levels (and few others) are refined
- Control Lipid profile

Organization and Scheduling

Maintaining an ongoing DIY high quality trial program, requires a lot of organization and scheduling.

Hacking Biology platform is meant provides a convenient way on how to carry on the protocol:

- Scheduling for taking supplements and pharmaceuticals
- Scheduling measurements (booking, appointments, recording data)
- Booklog to record fasting adherence and nutrition exception
- Providing supply organization (when to buy what and from where)

Software Platform to Manage all of this

Hacking Biology will develop a software platform to orchestrate the personal protocol in a way that's convenient to be self-managed

The platform central to the project is meant to pave the way of being used and shared among the vibrant aging communities online, but also by market players that can provides the therapeutics products and services to carry on own protocol.

The platform is provided as a AGPL-3.0 license free software and all the material are under Common Criteria .

Estimated Own Operational and Startup Costs

Estimated Operational Costs for the full protocol in a DIY way are:

- 500-700 eur/month of laboratory analysis
- 1200-2000 eur/month of nutritions / pharmaceutical / therapeutics

The startup operational costs will be less than 300 eur/month, increasing sophistication moving forward the project/protocol research, increase costs.

Investment costs for the development of the platform and the research analytics are estimated to be in the first year to be 35.000 euro

From here just notes / slides notes

NFR2 loss increase ROS

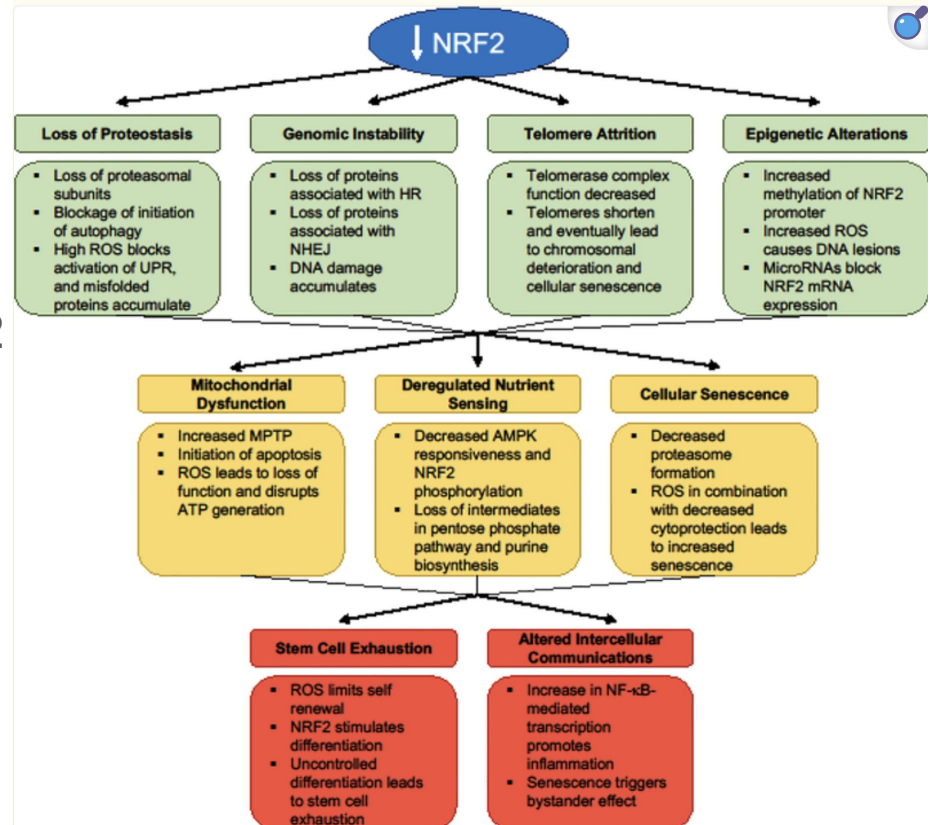
The role of Oxidative Stress on
aging's biological damage:

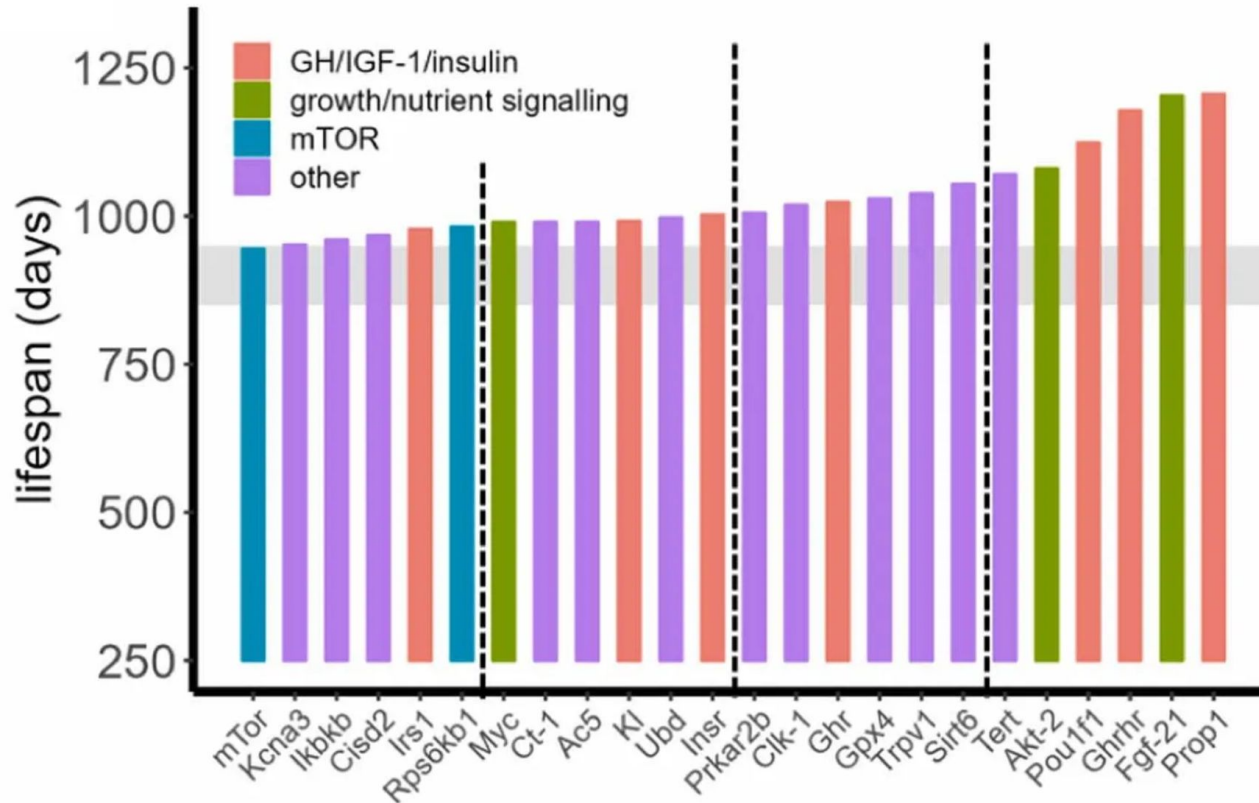
Nuclear factor erythroid 2-related factor 2

The needs to upregulate NFR2:

- Control more 600 genes activation

Figure 1. Loss of NRF2 and the Hallmarks of Aging.





Dietary approach

Implement CR (calories restriction) 20%

TODO enhancement:

- MR (methionine restriction)
- Cysteine restriction

"removing cysteine and reducing dietary methionine from control levels of 0.86% (i.e., 8.6 g/kg diet) to restricted levels of 0.17% (1.7 g/kg diet) increased longevity by 30–40%" <https://pmc.ncbi.nlm.nih.gov/articles/PMC4049285/>