I’ve got biospecimens... now what?

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Hallmarks of Aging
Biological Hallmarks of Aging

Targeting of Shared Hallmark(s) of Aging Can Improve Functional Domains, CDs, and GSs

Targeting one Hallmark Reduces:
- Effects of that Hallmark
- Effects of other Hallmarks
- Overall severity of CDs and GSs
How biospecimens can help

1. Age vs. aging biology
2. Pathophysiological mechanisms
3. Prediction and risk
4. Precision therapies
Delirium after Hip Fractures

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Geroscience in LUTS

Hip Fracture >65 yo

Geroscience Biomarkers
AD/Tau Biomarkers

Delirium
Long-term Cognition Functional Recovery

Multisystem, Longitudinal Biospecimens
Inpatient Delirium Measures

Long-Term Cognitive/Functional Outcomes
1. Age vs Aging Biology

Is the effect of age in X mediated by biological aging?

Biomarkers broadly representative of aging biology: epigenetic clocks, senescent cell burden, panels, composite clinical labs, telomeres?

Compare to AD biomarkers
2. Pathophysiological mechanisms

Which mechanisms of aging drive X problem?

Pathway-specific, maybe tissue-specific biomarkers, e.g. senescent cell burden, SASP in blood
3. Prediction and risk

Can biomarkers improve age-related risk prediction?

Biological analogues of physiological age clinical measurements (frailty indices, ADLs/IADLs, etc)
4. Precision therapies

E. Targeting of Shared Hallmark(s) of Aging Can Improve Functional Domains, CDs, and GSs

Targeting one Hallmark Reduces:

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Hallmarks of Biological Aging:

H1
H2
H3
H4

Clinical Diseases and Geriatric Syndromes:

GS1
GS2
CD1
CD2
4. Precision therapies

Aging is heterogenous; risk mechanisms may be too:
- Identify personal risks
- Match risks with targeted therapies

Delirium-Aging risk stratification

Mechanism-targeted therapy
National Geroscience Networks

NIA The Geroscience Network
NIA Geroscience Education & Training Network

Creating the Next Generation of Translational Geroscientists

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Translational Geroscience Network

https://www.gerosciencenetwork.org/
The Translational Geroscience Network has created a Facility for Geroscience Analysis (FGA) at Mayo Clinic to provide fee-based services to network members at costs competitive with those of external providers.

This specialized facility selects, optimizes and validates ancillary measures of fundamental aging processes to be assayed across all trials, with a view to establishing reference and advanced analytical capabilities to national resource.

The FGA plans to expand to include other laboratories across and beyond the network to facilitate and incorporating assays of key basic aging mechanisms in addition to senescence.

**FGA Assays**

<table>
<thead>
<tr>
<th>Generate Data</th>
<th>Specimen</th>
<th>Technique</th>
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<tbody>
<tr>
<td>Senescence Associated bGal Analysis</td>
<td>% of positive cells</td>
<td>- Fat tissue</td>
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<tr>
<td>Inflammation and SASP factors in blood and urine</td>
<td>Cytokine Concentration</td>
<td>- Plasma/Serum/Urine</td>
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<tr>
<td>P66 INK4a positive T lymphocytes</td>
<td>CD3+ p66+ ratio of mRNA</td>
<td>- Whole blood</td>
</tr>
<tr>
<td>NAD and NAD metabolites Analysis</td>
<td>NAD Level in pBMG cells, and tissue</td>
<td>- Whole blood*</td>
</tr>
<tr>
<td>IHC Staining for Senescence and Inflammatory Markers p66, p21CDK6**</td>
<td>Content of positive cells</td>
<td>- Wet Tissue</td>
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<tr>
<td></td>
<td></td>
<td>- immunohistochemistry</td>
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<tr>
<td>mRNA in Plasma</td>
<td>- Plasma</td>
<td>- PCR</td>
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<tr>
<td>Cell free Mitochondrial and Genomic DNA in blood</td>
<td>mtDNA in plasma</td>
<td>- Plasma</td>
</tr>
</tbody>
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*last updated: 11/16/2021

https://www.gerosciencenetwork.org/