



NATIONAL
ACADEMY
of MEDICINE

Chobanian & Avedisian
School of Medicine

BOSTON UNIVERSITY

**WORKSHOP: HOW NUTRITION AND
HEALTH**

**CHANGE OVER A PERSON'S LIFE
COURSE**

SESSION 3: Integrating Across Life Stages

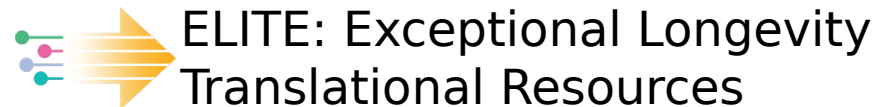
Middle to Older Age

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Disclosures



All generated data are broadly shared via:



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Agenda

- My framework (alá Dave Jacobs)
- But first a word from my profession –Geriatrics: Nutrition and malnutrition in older adults
- The vicious cycle of unhealthy aging and central obesity (fat)
- Metabolism, nutrition and obesity significantly impact the nine hallmarks of aging and suggest specific interventions to age better
- Some biomarkers
- Future Directions

My Framework

- The average human blueprint (genome) exposed to an optimal environment enables us to live to almost 90 years
 1. Managing stress (some can do this more effectively than others and some of this, to varying degrees is out of our control)
 2. Diet and Nutrition
 3. Exercise
 4. Sleep
 5. Don't do things that are bad for you (and for others): smoking, too much alcohol, catch certain viruses

Adding years to your life via healthy behaviors compresses the time with disability and disease. Therefore, the older you can get, the healthier you have been!

- Rarer genomes can afford protection, enabling slower aging, delay of or escape from aging-related diseases and substantially longer survival beyond age 90, e.g. 100-110. They can also moderate the effects of bad behaviors.

trition and Malnutrition in Older Adults

Multiple determinants at play:

- Specific health problems (e.g. malignancy, dysphagia/stroke, depression, COPD, CKD, CHF, atrophic gastritis, GERD, Alzheimer's, Parkinson's, chewing difficulty, B12 deficiency)
- Activity levels
- Energy expenditure/caloric requirements
- Ability to access, prepare, ingest and digest food.
- Financial and social impediments

Global Leadership Initiative on Malnutrition's (GLIM) Identification and Diagnostic Criteria of Malnutrition

- **Phenotypic Criteria:** Non-volitional weight loss, low body mass index (BMI), or reduced muscle mass.
- **Etiologic Criteria:** Reduced food intake or absorption, or underlying inflammation due to acute disease/injury or chronic disease.

Prevalence of Malnutrition in Health Care Settings (Europe) [metanalysis of 240 studies, 110,000 patients]

Outpatients: 6%

Hospital: 22%

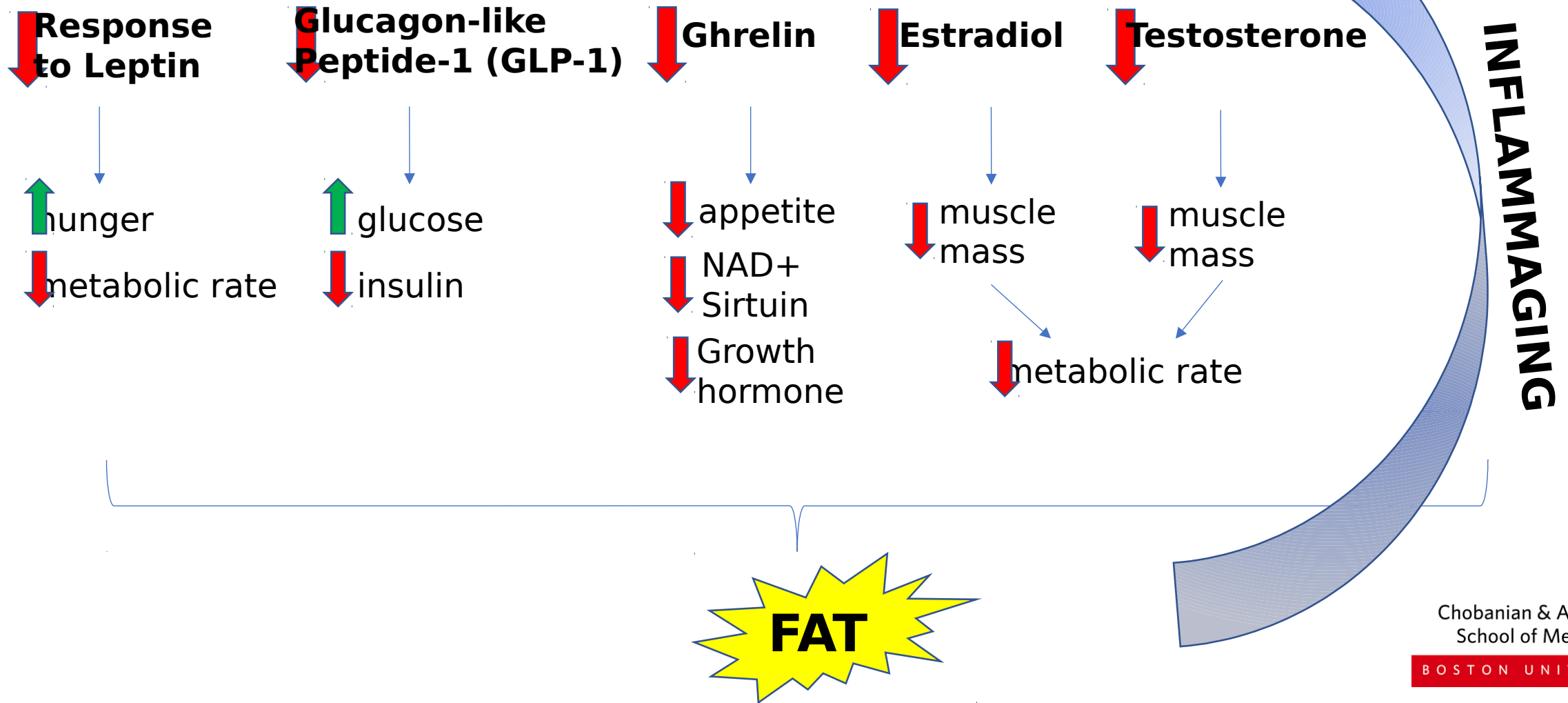
Long-term care and Sub-acute care: 29%

(Cereda et al. Clin Nutr 2016)

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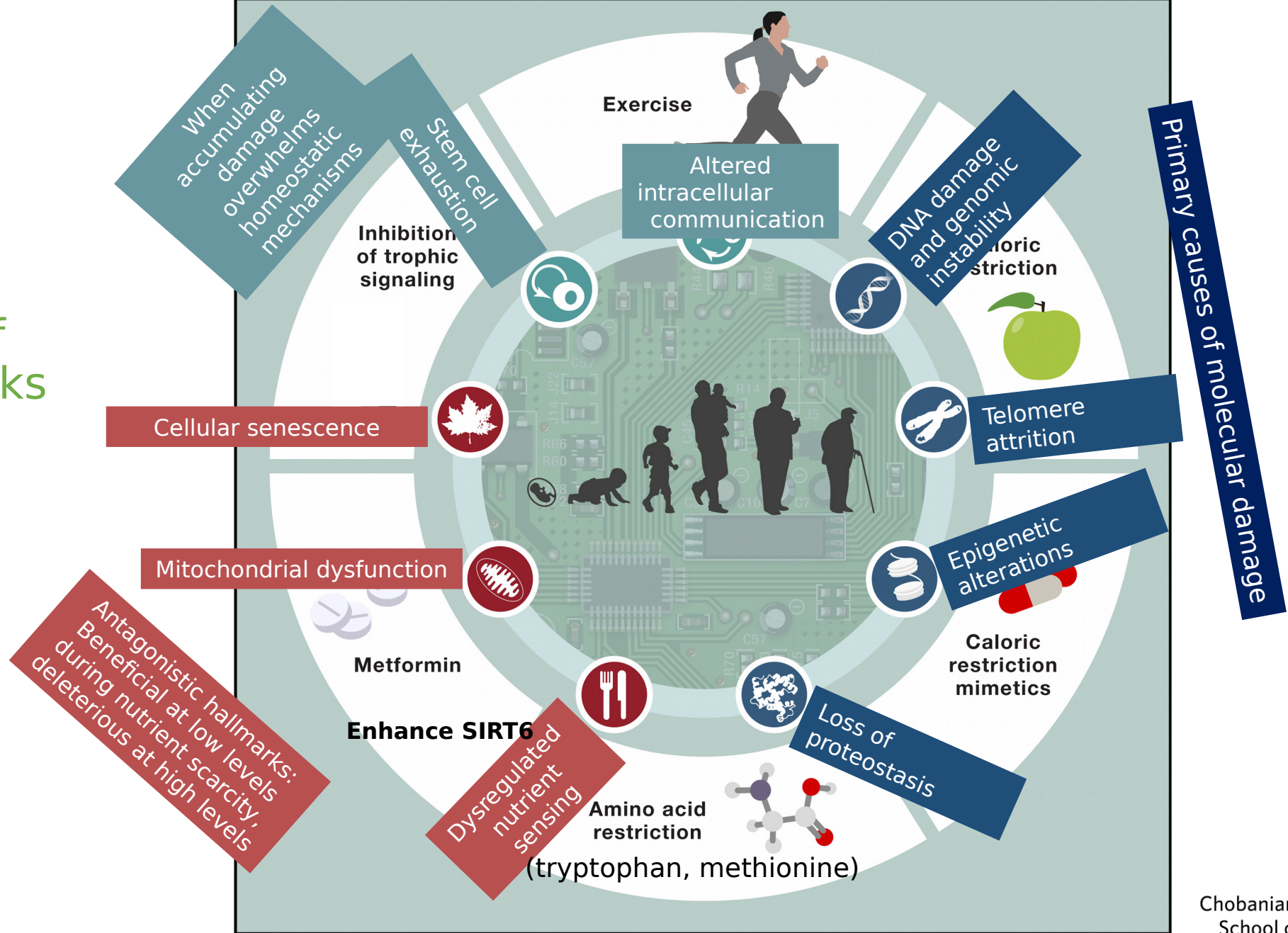
AGING



Metabolism, nutrition and obesity significantly affect each of the 9 hallmarks of aging

Hypercaloric nutrition and being sedentary accelerates aging.

Caloric restriction and exercise slows aging



(Adapted from Lopez-Otin et al, Cell 2016)

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Biomarkers (especially metabolic) Influenced By Diet

EXAMPLES (I've left out many)

Cardiovascular: Cholesterol:HDL ratio, LDL, triglycerides, iron

Metabolic Syndrome/central obesity: glucose, fasting leptin, adiponectin, ApoB/ApoA1 ratio, IL-1, IL-6, TNF- α , CRP, nitrotyrosine, HOMA, iron, sphingomyelin, insulin receptor, HbA1C. Gene expression: p65, IKK-b, IL-1b, cytokines, adipokinins, humanin, sirtuins, MOTS-c

Gene Expression: Oxidative and DNA damage: p53, mRNA Gadd45a/b, mdm2, mRNA Ogg2, mRNA XPC, Nrf2, Trx, SOD-1, gp91phos, NADPH oxidase, PARP1

Diets rich in fiber, vegetables, fruits and decreased meat, dairy: esterified/non-esterified fatty acids, carotenes, xanthophylls, mono- and di-galactosyldiacylglycerol

Future Directions

- The Westernized lifestyle of hypercaloric diets and sedentarism is associated with higher risk for aging-related diseases such as cancer, diabetes, heart disease, stroke, kidney disease and dementia. Interventions are needed to encourage people to adopt fiber- and complex carbohydrate-rich Mediterranean diets, reduce total calories and animal protein intake and increase food-free intervals (especially at night), and regular strength training and aerobic exercise.
- The metabolic and dietary effects on hallmarks of aging help inform us about potential pharmacologic and dietary interventions to promote healthy aging. Resources should be devoted to further investigate these effects and to translate findings into interventions and clinical trials.
- Longitudinally generated biomarker signatures under different dietary, metabolic and intervention conditions have the great potential of accelerating these discoveries. The cost and scope of proteomics, methylomics, metabolomics, transcriptomics (RNA and miRNA), microbiomics and genomics now make the generation and analyses of these data feasible and warranted.