LONGEVITY

Nicole Barylski Danner DO, FACN

Disclosure Statment

- I have no conflicts or disclosures to make regarding this talk.
- I do speak for Allergan for Botox, Qulipta and Ubrelvy
  - None of which are discussed during this talk.

Objectives

- Understand what longevity is.
- Discuss the pillars of health.
- Comprehend how each pillar affects longevity.
- Understand what is proven, what is speculated and what has no great data in the field of longevity.

Longevity

What is it?????

- "A long duration of individual life"
- Especially long-lived members of a population, whereas life expectancy is defined statistically as the average number of years remaining at given age.
  - Population's life expectancy at birth is the same as the average age at death for all people born in the same year.

Longevity

- New push for true “HEALTHCARE” not just “sick care”
- Big push for Longevity care in the healthcare industry but Functional Medicine, Chiropractors, Health Coaches, NP/Pas, Naturopaths etc.
  - Traditional Medicine DO/MDs somewhat limited due to the medical board stipulations, most not-covered by insurance and patient population.

AGING

- Complex process leading to loss of function, rendering people prone to most diseases
  - Gradual decline inf physical, mental and cognitive functions
  - Time-related deterioration of the physiological functions necessary for survival and fertility
- Genetic component
- Epigenic component
- Apoptosis

Aging

- Cellular damage: oxidative stress, DNA mutations, inflammation
  - 2-3% of oxygen is reduced in sufficiently by mitochondria to reactive oxygen species
- Molecular changes: proteins and other molecules can become altered or damaged
- Hormonal Imbalances: decline of growth hormone and testosterone decline
  - Menopause in women with alteration in Estrogen and Progesterone
- Environmental Factors: exposure toxins, UV radiation affects
- Shortening of telomeres

Aging

- Wrinkles
- Graying hair
- Joint stiffness and arthritis
- Eyesight deterioration
- Memory loss
- Osteoporosis
- Sarcopenia
- Slowing of sexual responsiveness

Pillars of Health for Longevity

- SLEEP
- EXERCISE
- NUTRITION
- MENTAL HEALTH

Sleep

- How many hours of sleep do you average?
- What is your quality of sleep?
- What impairs your ability to get good sleep?
- How do you feel with lack of or poor sleep?
- What affect does it have on your body?

SLEEP

- Average adult should have 7-9 hours of sleep most need 7.5-8 hours
  - In the last few decades sleep hours have decreased
  - Now the average American adults sleep on average 6 h 40 min during weekdays and 7 h 25 min during the weekend
  - In 1960 the average sleep duration was 8.5 h
  - Adolescents should have 9-10 hours of sleep
  - Now averaging about 7-8 hours

Sleep

- Endogenous oscillation over a 23-24-hour period generated in the suprachiasmatic nuclei (SCN) of the hypothalamus.
  - SCN gets input from retinal cells via the retinohypothalamic tract
  - SCN also gets serotenergic input from the median raphe that is involved in activity-induced phase shifts during daytime
  - The brainstem sends cholinergic projections to the SCN that plays a role in sleep and arousals
- The SCN then sends signals to the rest of the hypothalamus a single cell can generate circadian neural signals
  - The Dorsal Medial Hypothalamus (DMH) projects to neurons containing hypocretin/orexin which plays a role in arousal
  - SCN projects to the locus coeruleus with orexin to stimulate arousal
  - There is a link between the SCN and amygdala which plays a role between circadian system and affective disorders

Sleep

- Circadian rhythm can reset with different stimuli that in turn stimulate other Neurotransmitters and hormones
- Dawn and dusk are major factors that can stimulate melatonin from the pineal gland and then affects the SCN and sleep-wake cycle
  - Light (artificial and natural light) helps elicit wakefulness.
  - Wake time dictates sleep time, not vice versa
- Sleep stages: N1, N2, slow wave and rapid-eye-movement (REM) sleep
  - Slow wave sleep occurs with of synchronous firing of thalamo-cortical neurons
    - Believed to be time when create long-term memory

Sleep Deprivation

- Sleep plays a role in Neuroendocrine functions and glucose metabolism
  - Leads to weight gain and obesity
  - Impaired glucose tolerance,
  - Decreased insulin sensitivity
  - Increased evening concentrations of cortisol
  - Increased levels of ghrelin
  - Decreased levels of leptin
  - Increased hunger and appetite

Sleep Deprivation

- Increased headaches
- Pseudodementia/memory impairment/decreased attention and concentration
- Mood disturbance/worsening depression and anxiety
- Pseudo-Narcolepsy
- Increased risk of MVA and other accidents

Sleep Deprivation

- Cardiovascular implications:
- Impaired Autonomic function leading to cardiovascular problems
- Reduced Heart Rate Recovery after exercise
- Blood pressure
  - Reduces during sleep and sleep deprivation lead to higher BP readings
- Cardiac Arrhythmias more prevalent
- Changes in Endothelial function of blood vessels leading to atherosclerosis

Sleep Deprivation

- Neurological Disorders:
  - Memory decline
  - Disruption in c-AMP protein kinase signaling in the hippocampus
  - Impairment of executive function
  - Down regulation of lateral hypothalamus, the paraventricular nucleus, the arcuate nucleus and the mammillary bodies
- Build up of Plaque
  - Recent studies indicate increase in amyloid plaques and Tau levels with sleep deprivation thought to increase risk of the development of Alzheimer's dementia
- Induces low grade neuro-inflammation
  - Can lead to cerebral ischemia

Sleep Deprivation

- Gastrointestinal Disorders
  - GI track has its own enteric rhythm for digestion that is altered with sleep deprivation
  - Enteric nervous system coordinates intrinsic and responsive motor activity in the GI tract
  - Controlled by both sympathetic and parasympathetic input (brain-gut axis)
  - Controlled by prostaglandins, dopamine, seratonin, opiods, nitric oxide and bombesin
  - There is a circadian rhythm to gastric acid secretion
    - Secretion rises prior to sleep then falls to baseline 1.5 hours after onset of sleep

Sleep Deprivation

- Immune Disorder
  - Increase in CRP and Interleuken-6
  - Decreased mature neutrophils
  - Increase in pro-inflammatory and stress hormones altering the immune response
  - Restorative sleep promotes repair and regeneration
  - Lack of causes oxidative stress and increase in DNA damage, early apoptosis
- Cancer:
  - Increase in breast cancer in shift workers and flight attendants
  - Colon cancer patient's with disrupted sleep had higher mortality

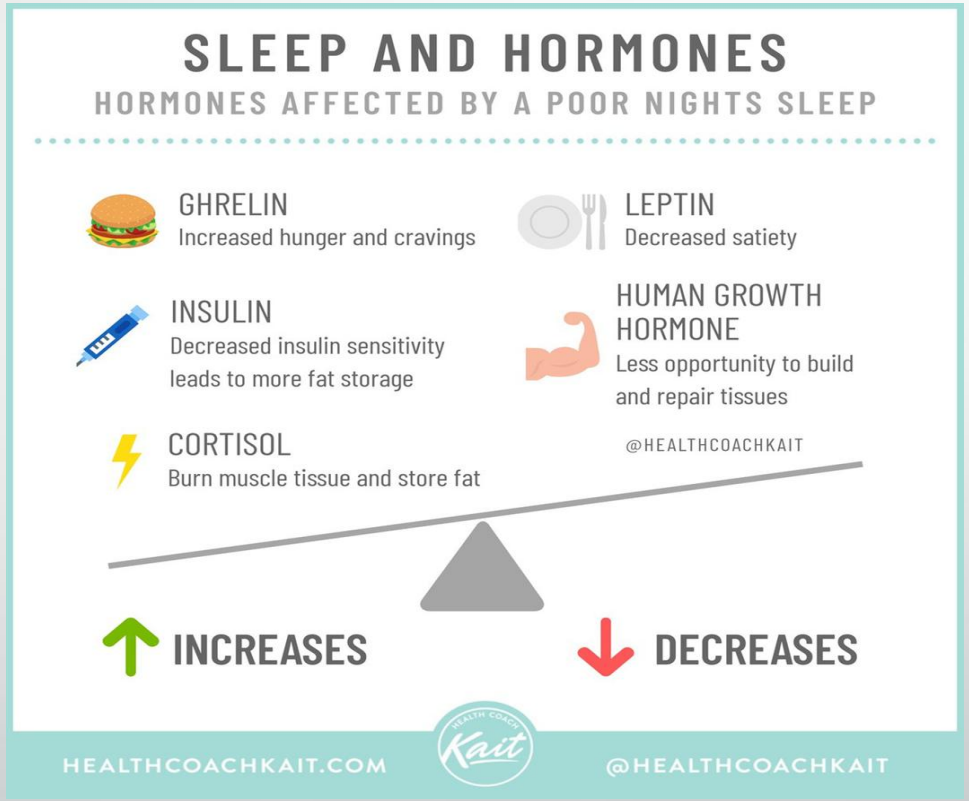
Sleep and Hormones

- GH
  - Released early in sleep in Slow Wave sleep
  - When sleep is disrupted can decrease or prevent the release of GH
- Cortisol (fluctuates over a 24 hour period)
  - Maximum release in early morning and declines as the day progresses with minimal amount in the evening with a rise in the later part of the night
  - Changes in sleep cycle will cause alterations in cortisol levels; lessens with more SWS
- Leptin
  - Hormone that assists in satiety and is secreted by the adipocytes
  - Secretion is dependent on food intake and is at a minimum in the morning and increases through the day culminating in a maximum at night
  - With constant caloric intake there is a sleep-related elevation of leptin.
- Ghrelin,
  - Hormone that results in hunger and is secreted by stomach cells
  - Levels decrease rapidly after meal ingestion and then rise again at the time of next meal but his higher during sleep than wakefulness

Sleep and Glucose

- Sleep-wake and wake-sleep transitions have an impact on glucose tolerance
- Cerebral glucose utilization represents 50% of total body glucose usage during fasting conditions and 20–30% postprandially
- Even with fasting during sleep hours glucose levels remain stable or fall only minimally however there is a decrease during fasting in the waking state
  - Glucose tolerance decreases as the evening progresses and reaches a minimum around mid sleep and then improves in the morning.
  - Decreased glucose tolerance is due to decreased glucose need by both by peripheral tissues and by the brain during sleep
  - PET imaging studies have shown a 30–40% reduction in glucose uptake during SWS relative to waking or REM sleep.
- Alterations in sleep schedule will alter the normal pattern and affect glucose levels and tolerance leading to weight gain

Sleep and Hormones



Sleep Stages

- SWS and REM
  - Important for memory consolidation
  - Decreased SWS and REM worsened cognition

EXERCISE

- How much exercise are you getting?
- What types of exercise and does it matter?
- How easy or hard is it to get your patients to exercise?
- Is this generational?

Exercise and the Brain

- Exercise:
  - Effects compound over time.
    - Better able to learn new and retain information
    - Expands brains capacity to learn in new ways.
    - Improves plasticity
  - Cardiovascular
    - HIIT, SIT, steady state low intensity.
  - Resistance
  - Short term and long term affects

Exercise and the Brain

- Resistance training and CV (with HIIT and long training) each week
  - 1 long slow distance work out per week for 45-75 minutes (blood flow and fuel delivery)
  - At least 1 HIIT/SIT/4x4 exercise
  - TUT (time under tension) with resistance training- challenging the muscle with the eccentric component of the exercise, engages the upper and lower motor neurons
  - Explosive jumping or eccentric landing- loading the skeleton

Exercise and the Brain

- Heart rate and BP increases
  - Increased blood flow to the brain and increased neural signals to the brain for arousal
  - Vagus nerve feed back from the brain to the body
    - Exercise Release Epinephrine for adrenals: increase HR, impacts capillaries and how fast blood flows.
      - Stimulates the vagus nerve to stimulate adrenergic nerves that stimulate the Nucleus solitarius to the Locus coeruleus then releases NE in the brain
        - Elevates activity in the prefrontal cortex(learn new activity), the hippocampus (memories), hypothalamus and other brain circuits
        - When NE is release DA is released too.

Exercise and the Brain

- 3 categories of brain areas the stimulate the adrenal glands to stimulate rls of adrenaline/epinephrine
  - Cognition
  - Effective States: emotions- affect the adrenals "stresses you out"
  - Motor network: cerebral cortex that sends signals throught the brain to the spinal cord through the IML to the cholinergic preganglionic neurons to the adrenal medulla that releases Epi that affects the peripheral organs but also feed back to the Vagus to the brain
    - Core muscles stimulate the adrenals more and compound movements

Exercise and the Brain

- Hypothalamus stimulates the pituitary which also stimulates the adrenal glands to release epinephrine and cortisol
  - This is slower pathway with less immediate impact on cognition
- Astrocytes sitting around the synapses: read out the amount of activity between neurons.
  - They primarily use glucose for fuel but can produce lactate when there is high activity
    - Increase BDNF down stream

Exercise and the Brain

- Anterior mid-cingulate cortex
  - Engaged with challenges (emotional and physical)
    - Doing things you do not want to do (once a week)
      - Cold plunge, exercise you do not like
  - Involved in learning, arousal, dopamine system
  - "super agers" have superior brain healthy full volume of the brain or even growth, no atrophy as seen in most with aging – ant Mid cingulate cortex area
    - Doing well cognitively and physically
    - Higher levels of persistence, willingness to exert more effort
    - Stimulates the will to persevere

Exercise and the Body

- Studies: SIT and long performance → Improves arousal
  - Improved cognitive testing
  - Increases brain performance
- Increase autonomic nervous system will increase arousal
  - Increases circulation of cortisol which improves memory and learning
    - Occurs if exercise is after, during, or before exposure to new material
    - Improves recall, cognitive flexibility and retention

Exercise and the Body

- BDNF
  - Brain Derived Neurotropic Factor
    - Act on Neurons
      - Resists age related degeneration especially in the hippocampus
      - Mediated by osteocalcin
        - Should do exercises the load the skeleton to release osteocalcin
          - Jumping and controlling the eccentric load of the exercise (jump rope, high knees, box jumps)
          - Bones to brain to hippocampus – improves size and structure of the hippocampus

Exercise and the Body

- BDNF & nerve growth factor
  - BDNF is an activity dependent molecule (electrical activity rls BDNF)
    - Stabilize and enhance the growth of neurons
    - Keep neurons connections in place increase connections

Exercise and the Body

- Zone 2 exercise
  - moderate-intensity aerobic workout performed at 60-70% of your maximum heart rate.
    - considered an essential component of a well-rounded fitness program, offering numerous benefits:
      - Improves aerobic capacity: Increases the body's ability to use oxygen efficiently during exercise.
      - Burns fat: Promotes fat burning as the body relies on stored fat for energy.
      - Builds endurance: Helps sustain exercise for longer periods without fatigue.
      - Reduces stress: Provides a calming and relaxing effect.
      - Improves cardiovascular health: Strengthens the heart and blood vessels.
    - Studies mostly on men (women have different mitochondrial function)

Exercise and the Body

- HIIT
  - Enhanced arousal and enhanced blood flow to the brain to improve cognitive function
  - If too much (2 HIIT bouts) acutely reduces cognitive tasks and performance drops
- SIT (sprint activity)all out for 30 seconds with 1-3 minutes of full recovery
  - Major stimulant to the CNS
    - Fast muscle contraction and keeps neuropathways going and helps avoid cognitive decline
    - Epigenic changes in the muscle and uses up glucose stores without the use of insulin that helps with insulin resistance.
    - Cross talk between fat and skeletal muscle to give impulse that we do not need the extra visceral fat
    - Works on proprioception to help decrease falls
- Women seem to need more SIT work and men more Zone 2 work

Exercise and the Body

- Exercise snacks brief bursts of exercise to wake the brain up
  - Six, 6 second all out efforts then 1 minute in between shown to enhance cognitive performance

Exercise and the Body

- Bones and exercise
  - When bones have mechanical stressors bones release osteocalcin
    - Travels the brain and encourage growth or neurons in the hippocampus (memory)
      - Research Suggests increased number of dendate gyrus in the hippocampus for improved memory.

Exercise and the Body

- Exercise utilized fuel differently
  - Liver to brain neuropathways
    - Communicates with glial cells that will tell the brain that other sources of fuels are being use depending on glucose sources
    - Learns to burn certain fuels with exercise

Exercise and the Body

- Lactate and exercise
  - Released by muscle that can decrease hunger
  - Affects the hypothalamus activity that decrease
  - Is fuel for neurons to spare glucose that can be used later for memory
  - Releases Veg F → endothelial growth factor that stimulates the growth of the BBB
    - Aging brain breaks down the BBB and exercises counteracts that

Exercise and Peri/Menopause

- Hormones act differently
  - Have to have an external stressor to get hormones to react
  - Peri/early Post
    - 10- 30 sec sprints with 1 minute in between
  - Later Post-Menopause
    - Shorter regular doses of SIT/resistance type exercises; do something daily but for short time at high intensity
      - 4- 30 second sprints with 1 minute in between
    - Keep lean mass, bones strength proprioception and cognition.

Exercise and Sleep

- Exercise improves sleep
  - HIIT increases deep slow wave sleep
  - Early day sleep can improve amount and quality of sleep along with REM sleep

Exercise and the Body

- Weight vest during exercise
  - Shown to improve body composition,
  - reduced serum resistin
  - lowered insulin resistance
    - Reducing cardiovascular disease risk factors in normal-weight obese women.
  - Increase bone density

Lack of exercise

See negative effects after about 10 days of no exercise

Decreased brain oxygen levels

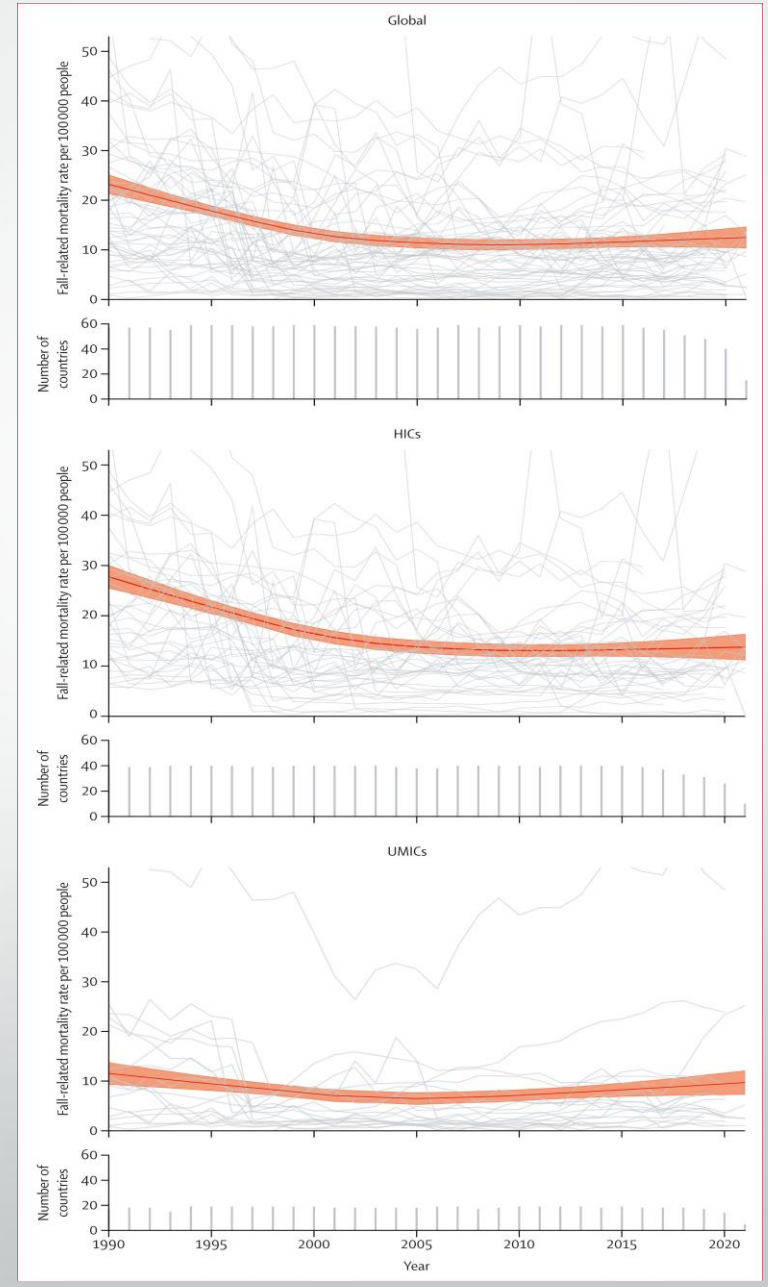
Muscle Atrophy

Decreased endurance

More falls

Mortality of Falls

The Lancet Healthy Longevity, Volume 6, Issue 1, 100672



Exercise Recommendations

- Varying data on the “best” exercise.
- Move it or lose it and any is better than none.
- At this time data points to:
  - 2 days of cardio: HIIT, SIT, endurance
  - 3 days of resistance training

Exercise

- Rat study that shows that lack of exercise basically ages the body and may turn on apoptosis of cells through out the body
  - Exercise tells the body that we are still living and to regenerate cells
  - Larger long-term study on humans but data not yet available

NUTRITION

- Calories in vs calories out
  - The Obesity Code: Unlocking the Secrets of Weight Loss by Jason Fung
    - Hormones help regulate metabolism
      - Reduce added sugars
      - Reduce refined grains
      - Moderate protein intake
      - Increase natural fats

Nutrition

- Whole foods are the best
- Autoimmune Protocol Diet.
- Keto/Paleo diet
- Carb cycling
  - 2 days Keto to deplete glycogen stores
  - High carb days
  - Low macro days

Nutrition

- Nutrition
  - can alter brain function in short time frames
    - Alters neurotransmitters and neuronal firing, and in the long-term, such as by altering membrane structure.
    - Proper nutrition during brain development is extremely important.
- Lots of books and articles on preservatives in our foods, artificial dyes, seed oils, processed sugars
  - Evolving data
- Suspected of over 10,000 chemical ingredients in US foods while 300 in European foods.
- Some evidence processed food increases ADHD

Nutrition and the Brain

- Omega-3 Fatty Acids:
  - fatty fish (salmon)-- crucial for brain development and function, impacting learning, memory, and mood regulation.
- B Vitamins:
  - Part of healthy brain cell function and neurotransmitter production
    - deficiencies potentially leading to cognitive issues/nerve damage
- Vitamin E:
  - antioxidant, protecting brain cells from damage caused by free radicals

Nutrition and the Brain

- Antioxidants:
  - Fruits and vegetables, tea, black coffee-- combat oxidative stress in the brain.
- Leafy Greens:
  - Rich in folate and vitamin K --vital for cognitive health and may help delay cognitive decline.
- Protein:
  - Necessary for building and repairing brain cells, ensuring proper neurotransmitter function.
    - 1-1.4 grams of protein per pound
    - Study with only increasing protein without exercise changes body composition.

Nutrition and the Body

- Vitamin D
  - Deficiency can cause low iron/anemia
  - Low bone density- fractures
  - Worse PMS symptoms
  - Supplement Vit D especially if deficient

Gut Health

- Leaky gut syndrome
  - Controversial but some good data behind it
  - Healthy gut microbiome is important for digestion and metabolism
  - Bentonite clay shown to help your gut absorb more nutrients by increasing the flora in your intestine
- Blood testing for food allergy/sensitivity
  - Controversial
    - People still pay a lot of money for this testing

Fasting

- Calorie restriction as been shown to increase lifespan
  - Reduction of body fat and insulin signaling
  - Improved Cardiometabolic risks
- Intermittent fasting
  - improve memory, cognition, and executive function
    - due to the growth of new neurons in the hippocampus

Fasting

- Neurogenesis:
  - promote the growth of new neurons in the hippocampus.
- Oxidative stress:
  - protect hippocampal neurons from oxidative stress, which can lead to memory deficits.
- Longevity gene Klotho:
  - increase the expression of the longevity gene Klotho.
- Ghrelin:
  - Increases ghrelin, which may improve test results for attention and executive functions.
    - may also stimulate neurons that enhance learning and memory.

Diet Plans

- Ketogenic diet
  - Weight control
  - Prevent sarcopenia
  - Appetite suppressant
- Mediterranean diet
  - ~24% reduction in the development of dementia

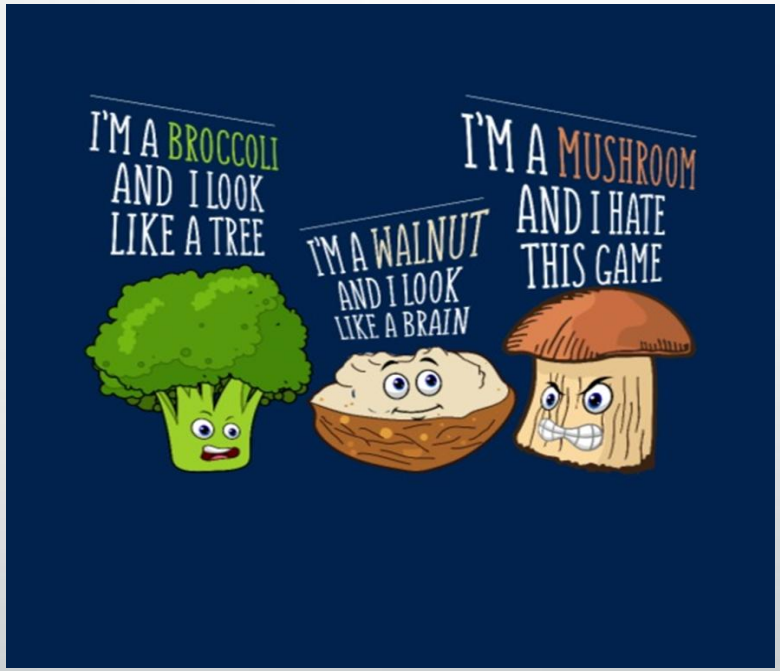
Diet Plans

- Intermittent Fasting vs Time Restrictive Eating
  - Improves metabolic regulation
    - Circadian biology
    - Improves the gut microbiome
    - Improves other lifestyle behaviors such as sleep

Metformin

- Can counter acti age-related disorders and improve health
- Being tested for "age-targeting effects"TAME (targeting aging by metformin).
  - Decreases signs of aging
    - improving nutrient sensing,
    - enhancing autophagy
    - Protects against macromolecular damage
    - Delays stem cell aging
    - Enhances mitochondrial function
    - Lengthens or prevents shortening of telomeres

Adaptogens


I'M A BROCCOLI AND I LOOK LIKE A TREE
I'M A WALNUT AND I LOOK LIKE A BRAIN
I'M A MUSHROOM AND I HATE THIS GAME

Adaptogens/Stimulating

- Cordyceps: (Cordyceps sinensis)
  - Incresaes focus, stamina and energy
  - Immunostimulant: stimulates T helper cells and enhances activity of Natural killer cells
  - Increases Estrogen, progesterone and testosterone (thru cordycepin)
  - Improves mood by increasing adenosine
  - Improves Athletic performance with vasodilation and increased ATP levels
- 1,000-3,000 mg daily (can use with Schisandra)

Adaptogens/Simulating

- Rhodiola Rosea
  - Anti-fatigue and improves cognition
  - Enhances Neurotransmitters- Serotonin, DA, NE by decreasing breakdown
  - Selective Estrogen Reuptake Modulator
    - Improves Meno-pause related: cognitive, psych, CV and osteoporosis issues
- 150 mg bid – can use with Schisandra in a.m. (start Schisandra first)
- Caution: increased immune system, do not take with immunosuppresants or MAOIs, lowers blood pressure

Adaptogens/Simulating

- Schisandra: (Magnolia berry/Schisandra Xhinensis)
  - Improves endurance and mental performance
  - Enhances blood vessel compliance vis Nitric oxide
  - Modulates Estrogen by increasing excretion of estrogen metabolites
  - Improves aerobic activity but inducing oxidation in mitochondria
- 13.5 mg/kg/day vs 500- 2,000 mg daily
  - Start on its own then add other adaptogens after 2 weeks if needed

Adaptogens/Stimulating

- Maca: (Lepidum meyenii)
  - Sex hormone support: high in glucosinolates
    - Reduces Estrogen metabolism
  - Anti-inflammatory
  - Helps regulate adrenal and thyroid function
  - Can help with early peri-menopause and as effective as some HRT
- 2 gm daily for vasomotor and hormone symptoms
- 3.5 gm daily for mood and psych issues
  - NOT recommended with thyroid issues.

Adaptogens/Stimulating

- Siberian Ginseng: (Eleutherococcus senticosus)
  - Affects on the Neuro-endocrine complex- anti-stress
  - Stimulates physical and cognitive performance
  - Increases T- helper and natural killer cell activity (treats chronic fatigue syndrome)
  - Can modulate awaking cortisol levels
  - Increases estrogen effects by binding to estrogen receptor sites
- 300 mg for 8 weeks then 2-3 weeks off
- For fatigue 500 mg bid for 8 weeks then 2-3 weeks off
- Can increase bleeding, not for autoimmune diseases or meds

Adaptogens/Calming

- Ashwagandha: (Withania somnifera)– Anti-stress
  - Antioxidant and anti-inflammatory,
  - blocks Aβ production,
  - inhibits neural cell death,
  - dendrite extension,
  - neurite outgrowth –stops neuritic atrophy
  - restores synaptic function, neural regeneration, reverses mitochondrial dysfunction,
  - improves auditory–verbal working memory, executive function, processing speed, and social cognition in patients
  - Hormonal precursor: increases LH and T_3,T_4

Adaptogens/Calming

- Ashwagahnda
  - 250 mg : stress, HPA axis and anti-inflammatory properties
  - 300 mg bid x 2 months: body composition, blood glucose control
  - DO not use with hyperthyroidism
  - Med Do not use with prostate CA

Adaptogens/Calming

- Holy Basil (Tulsi/Ocimum Sanctum)
  - Reduced anxiety and depression
  - Anti-microbial
  - Reduces oxidative tissue damage
  - Modulates cortisol levels
  - Improves glucose control
- 500 mg bid
  - Reduced blood clotting: do NOT use on anticoagulants

Adaptogens/Calming

- Chaga: (Inonotus obliquus)
  - Immune modulating by modulating cytokines inhibiting Cox-2
  - Stimulates WBC production
  - Antioxidant thru beta glucan polysaccharides
  - Good antioxidant for those on OCP or peri-menopausal
- 250-500 mg bid-tid
  - Can increase bleeding
  - Caution in those with auto-immune disease

Adaptogens/Calming

- Reishi
  - Increases sensitivity of Estrogen receptors
  - Reduces vasomotor symptoms
  - Increases concentration and focus
  - Reduces sympathetic drive
  - Improves immunity by enhancing natural killer cells affect against pathogens (including some cancers)
  - Increased antioxidant capacity with protecting cells from oxidative damage
- 1.5-2 grams dried poweder
- Caution: increased bleeding and lowers blood pressure
- SE: insomnia nausea, dry mouth, bloody stools, Liver failure

Adaptogens/Calming

- Lion's mane : (Hericium erinaceus)
  - neuroprotective,
  - improves cognition,
  - anti-inflammatory,
  - blocks Aβ production,
  - stimulates neurotransmission and nerve outgrowth
- 500-1000mg daily-tid
- Start alone but can add in Reishi and Ashwaghanda to boost cognition and reduce stress

Adaptogens

- Lions Mane
  - double-blind, parallel-group, placebo-controlled study involving 30 patients with MCI, a 16-week treatment with 3000 mg of Lm extract resulted in increased scores on the cognitive function scale in the experimental group compared to the placebo group [131].
  - In another small, randomized study involving patients with mild AD, Lm extract improved scores on the activities of daily living (e.g., personal hygiene, dressing, preparing food, etc.) over 49 weeks [132].
    - pre-clinical and clinical results suggest that lion's mane is a well-tolerated and safe herb for the management of AD.

Creatine

- 3-5 grams per day
  - creatine maintains intracellular levels of adenosine triphosphate (ATP) during energy-demanding cerebral activities, which account for about 20% of the body's energy consumption
- Creatine supplementation on indices of cognition, depression, concussion, and TBI
- Long-term high-dosage creatine supplementation increases brain creatine stores.
- Creatine supplementation can improve cognition and memory, especially in older adults or during times of metabolic stress (i.e., sleep deprivation).
- Creatine supplementation improves aspects of recovery from traumatic brain injury in children and has the potential to reduce symptoms of depression and anxiety.
- There is some evidence that creatine supplementation improves outcome measures in those with muscular dystrophy but not other neurological diseases or conditions such as Parkinson's disease or amyotrophic lateral sclerosis

Cold Plunge/Sauna

- Cold Plunge
  - Health versus training reasons
    - Health: couple times a week
    - Training: not too frequently as reduce inflammation that is used for gains
  - More beneficial for women at warmer temp (55 degree)
  - Men has different vasocontriction (44-30 degree)
- Sauna
  - Heat does more than a cold plunge for training for long term benefits for women
  - Men may not see the same benefits
    - Conflicting research.

Mental Health

- Mental and spiritual health are equally important
  - Mindfulness
  - Cognitive Behavioral Therapy
  - Headspace ap
  - Spiritual Counseling

Mind, Body and Spirit are all connected one cannot be healthy without the other.

Questions??

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