

Save Your Brain

And your life

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Disclosures

- No commercial conflicts of interest
- Rejuvacare



The pre-1990s view of the brain

- All brain growth finished by age 20-something
- Any brain cells damaged were permanently lost
- No stem cells in the brain
- Gradual decrease in brain size and function with age because of loss of brain cells – 85,000/d
- All functional improvements past age 20 were the result of rearrangement of brain connections

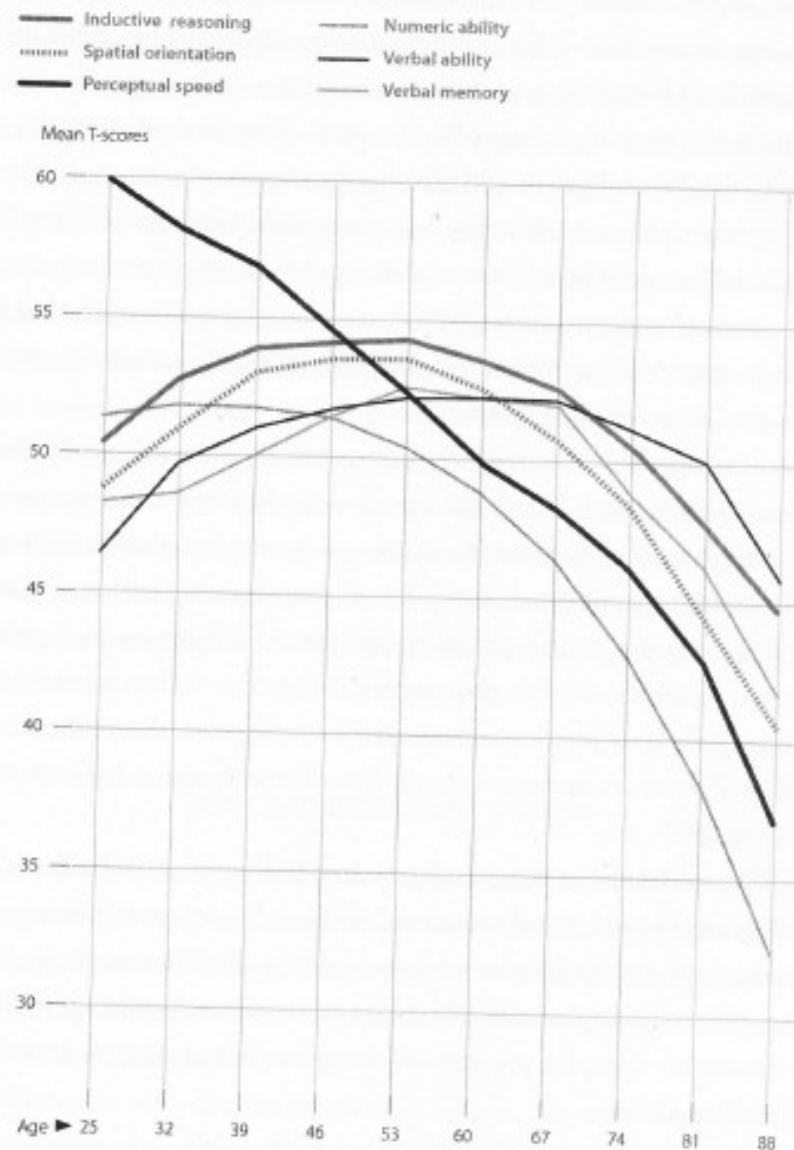
Since 1990 we have found:

- The brain has plenty of stem cells
- New brain cells are grown all the time
- Many different factors determine how fast brain cells grow and/or die
- Some of these factors are under our direct control
- General health and happiness are directly attributable to brain health and growth

What do we have to worry about?

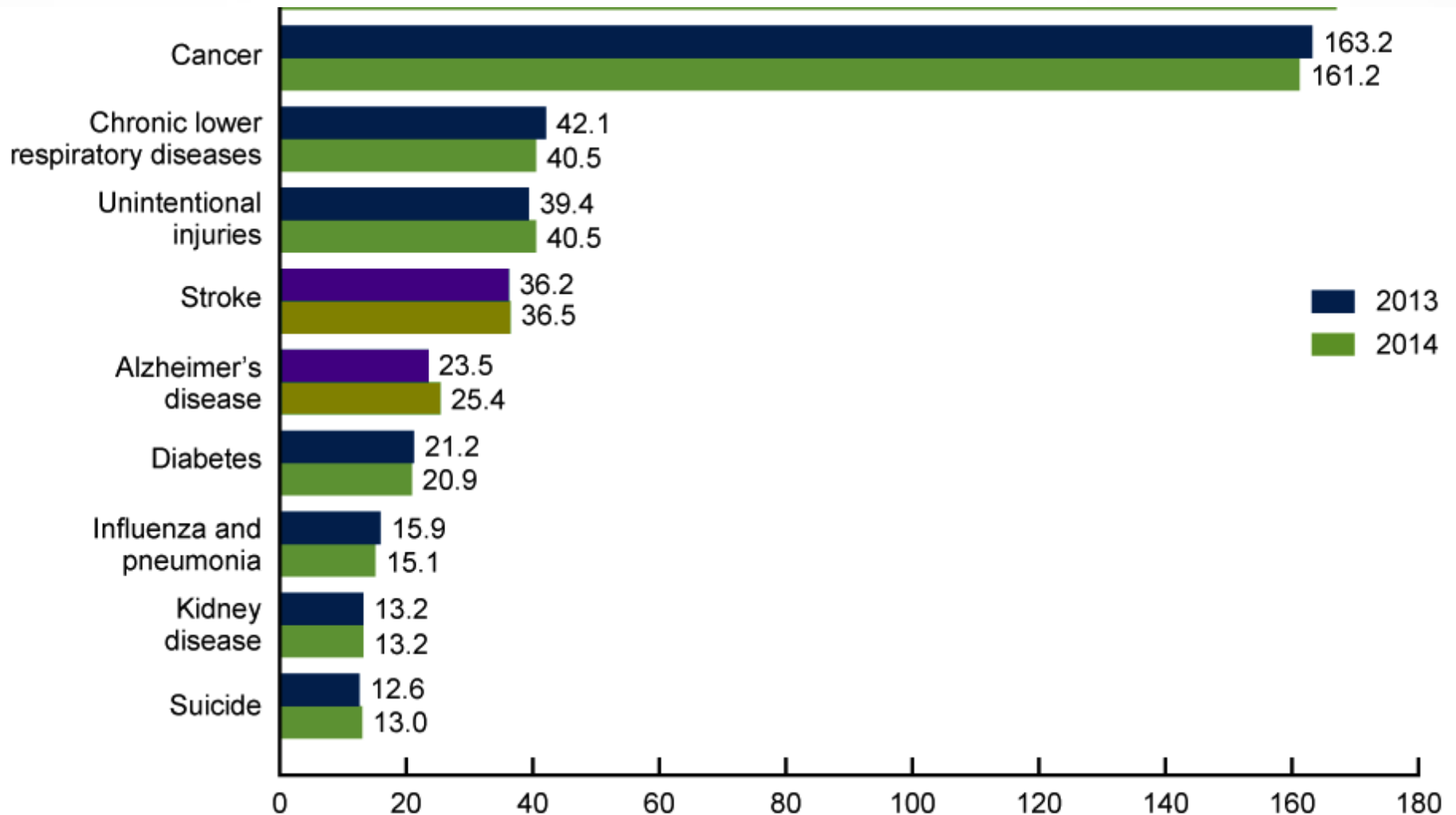
- Inadequate replacement of dead or damaged brain cells (neurons)
- Dementias (Alzheimer and others)
 - Incidence increases with age
- Stroke
 - Correlated with vascular disease, hypertension
- Parkinson

Decline In Cognitive Functions with Age



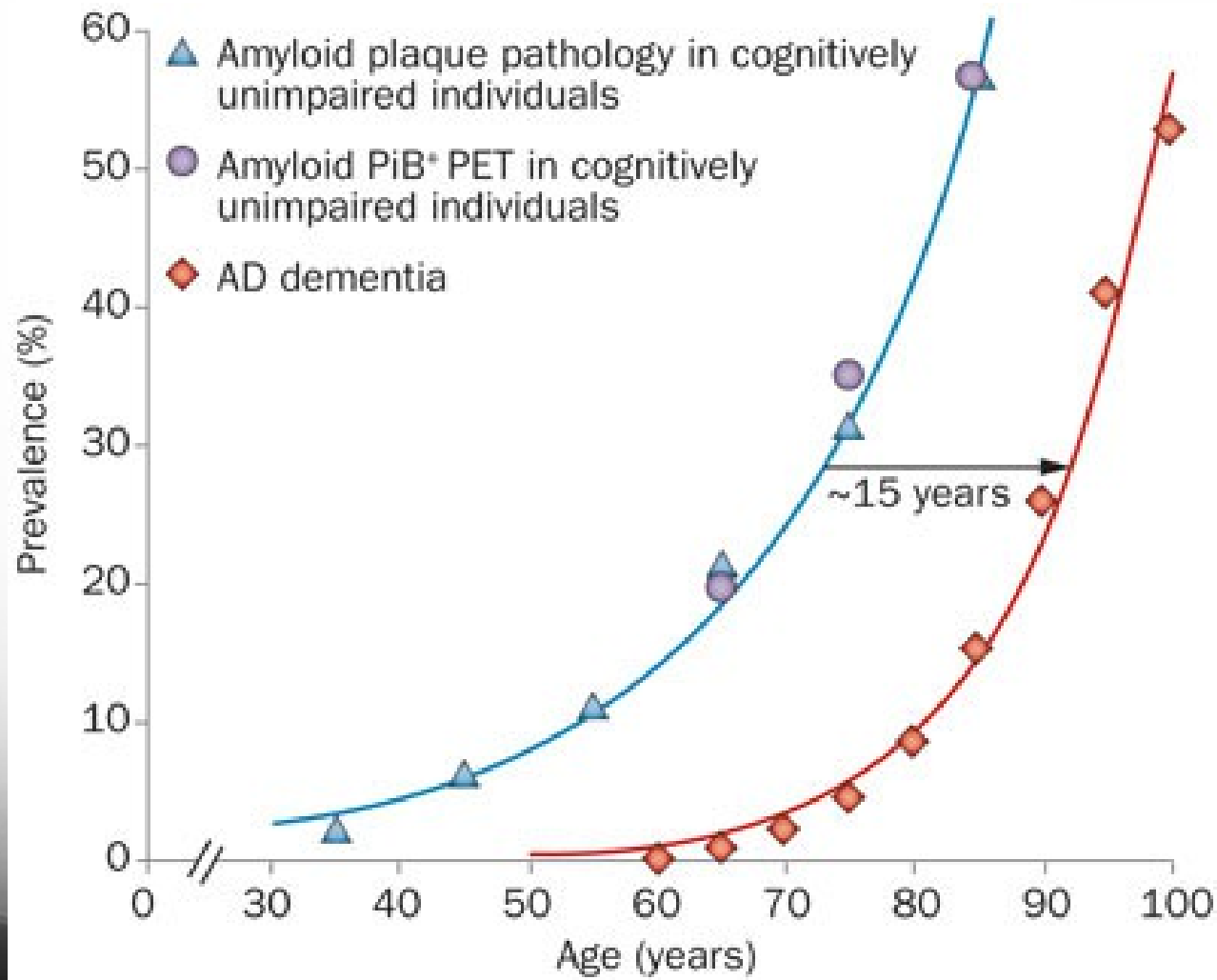
Based on seven-year longitudinal data from the Seattle Longitudinal Study.
 K. Warner Schaie, et al. The Seattle Longitudinal Study: Relationship Between Personality
 and Cognition, *Neuropsychol Dev Cogn B Aging Neuropsychol Cogn*, June 2004; 11(2-3): 304-
 324.

4th & 5th most common cause of death



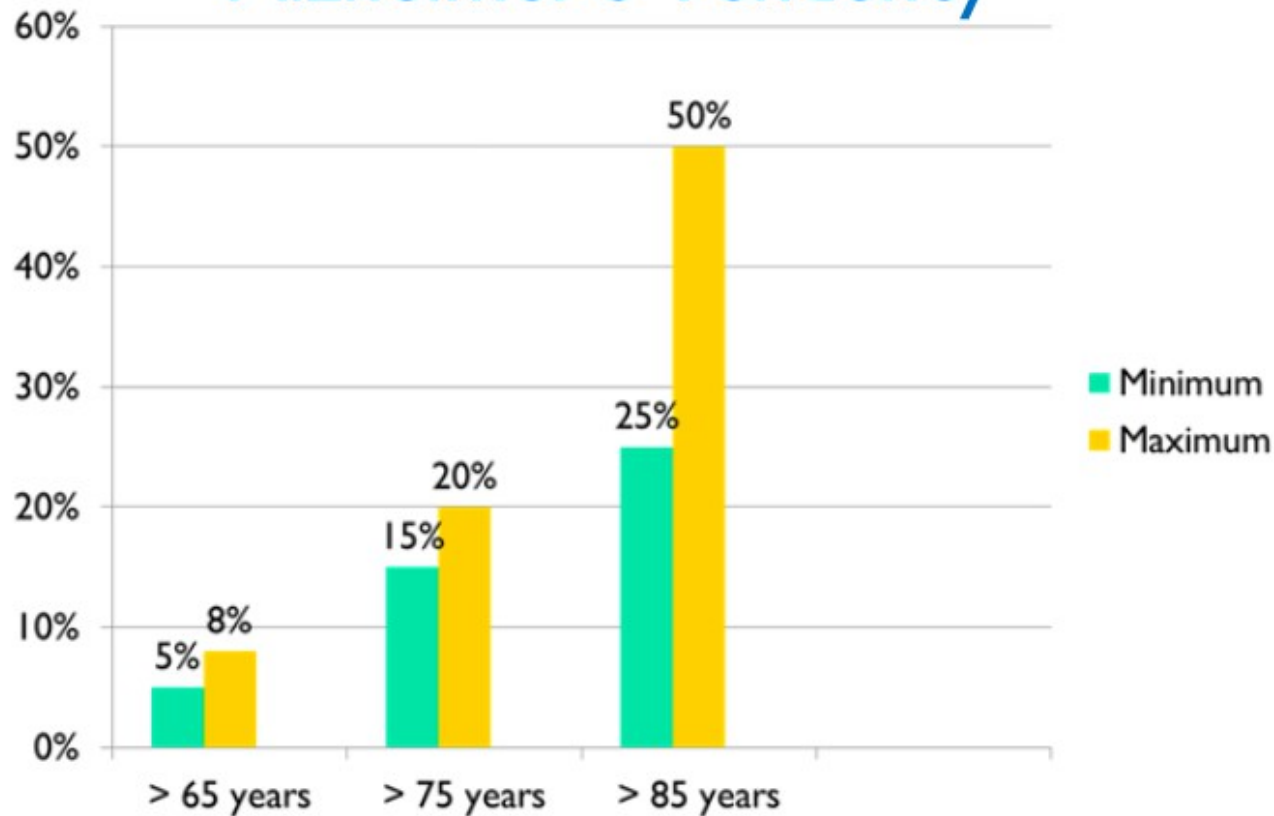
Alzheimer disease

Where will you be in 15 years?



Increases with age

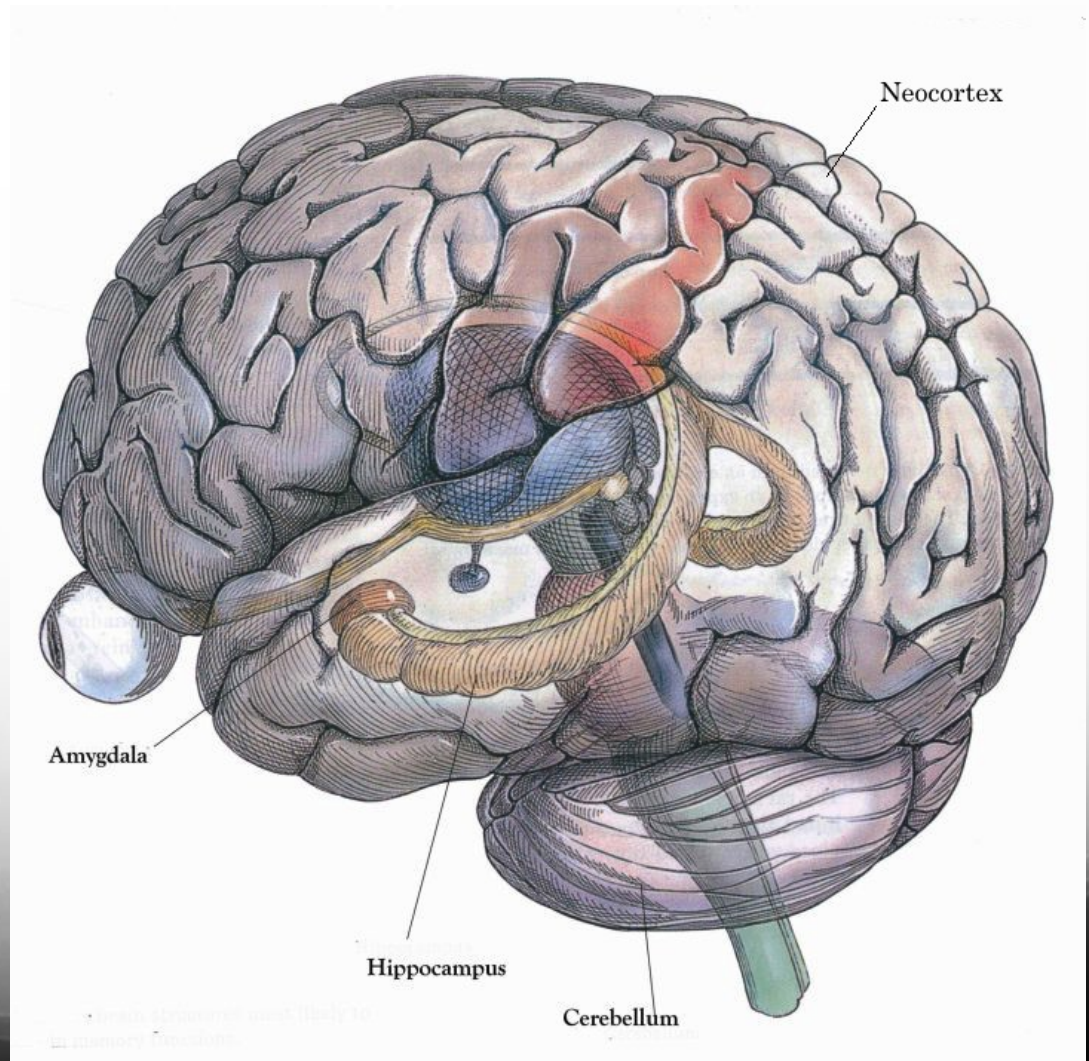
Alzheimer's Tendency



Neuroanatomy

The hippocampus takes short term memory and turns it into long term memory. I.e. learning.

The neocortex is the repository of memory and cognition.

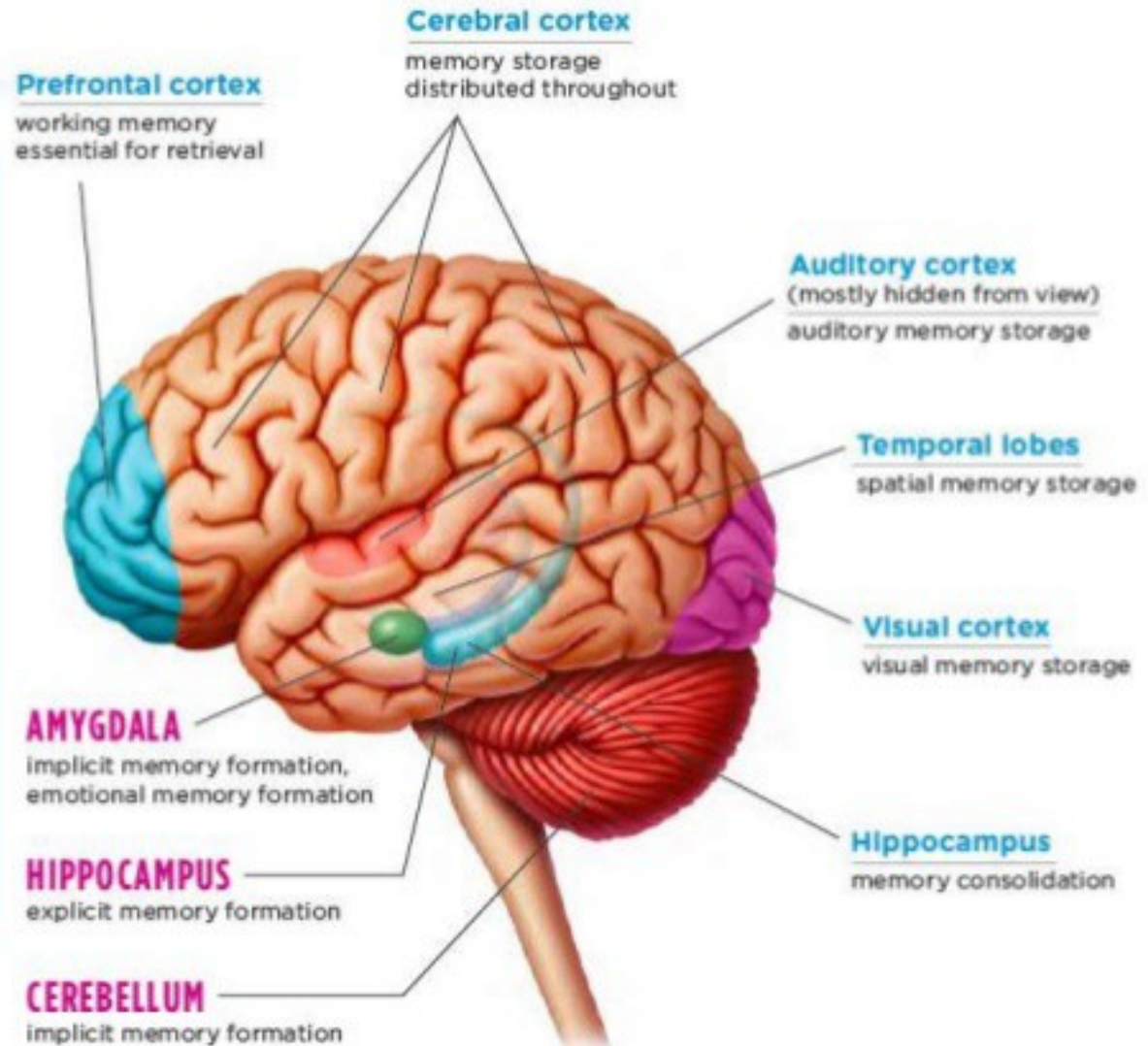


Memory Formation

Memory Location

Memory is a complex system involving multiple structures and regions of the brain.

Memory is formed, processed, and stored throughout the brain, and different types of memory have different paths.



What can we do?

What can we do?

- Make sure the brain has an optimum supply of oxygen and nutrients
 - Exercise
 - Diet
 - Supplements
 - Sleep
 - Hormone replacement
- Protect the brain from damage
 - Trauma
 - Environmental toxins

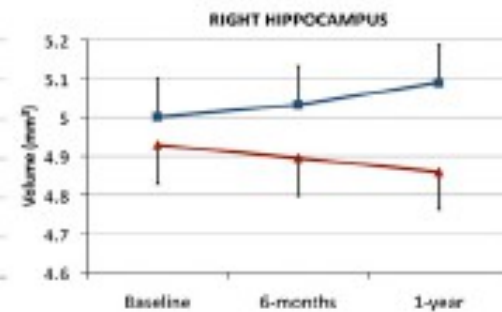
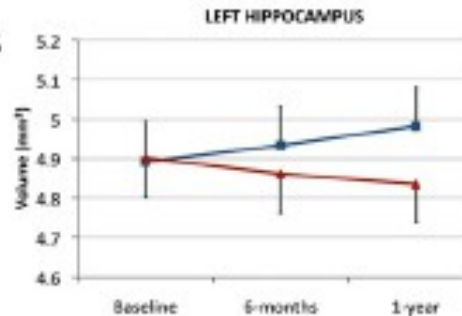
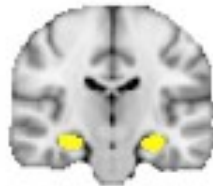
Exercise

- The most powerful enhancer of brain cell growth
- Aerobic and anaerobic better than stretching
- Easily lost if not maintained

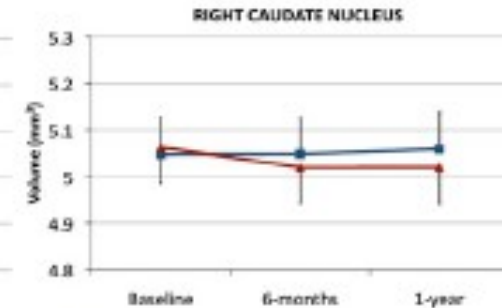
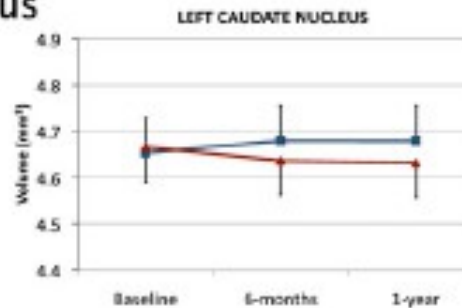


Exercise > Bigger Brain

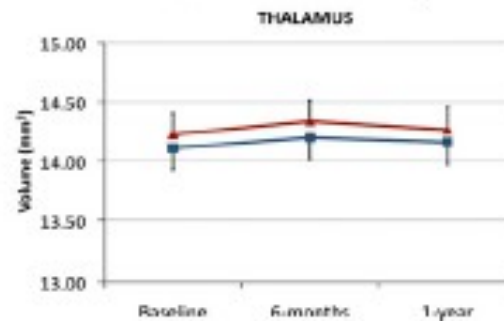
A Hippocampus



B Caudate Nucleus



C Thalamus



Exercise
Stretching

Better memory and cognition

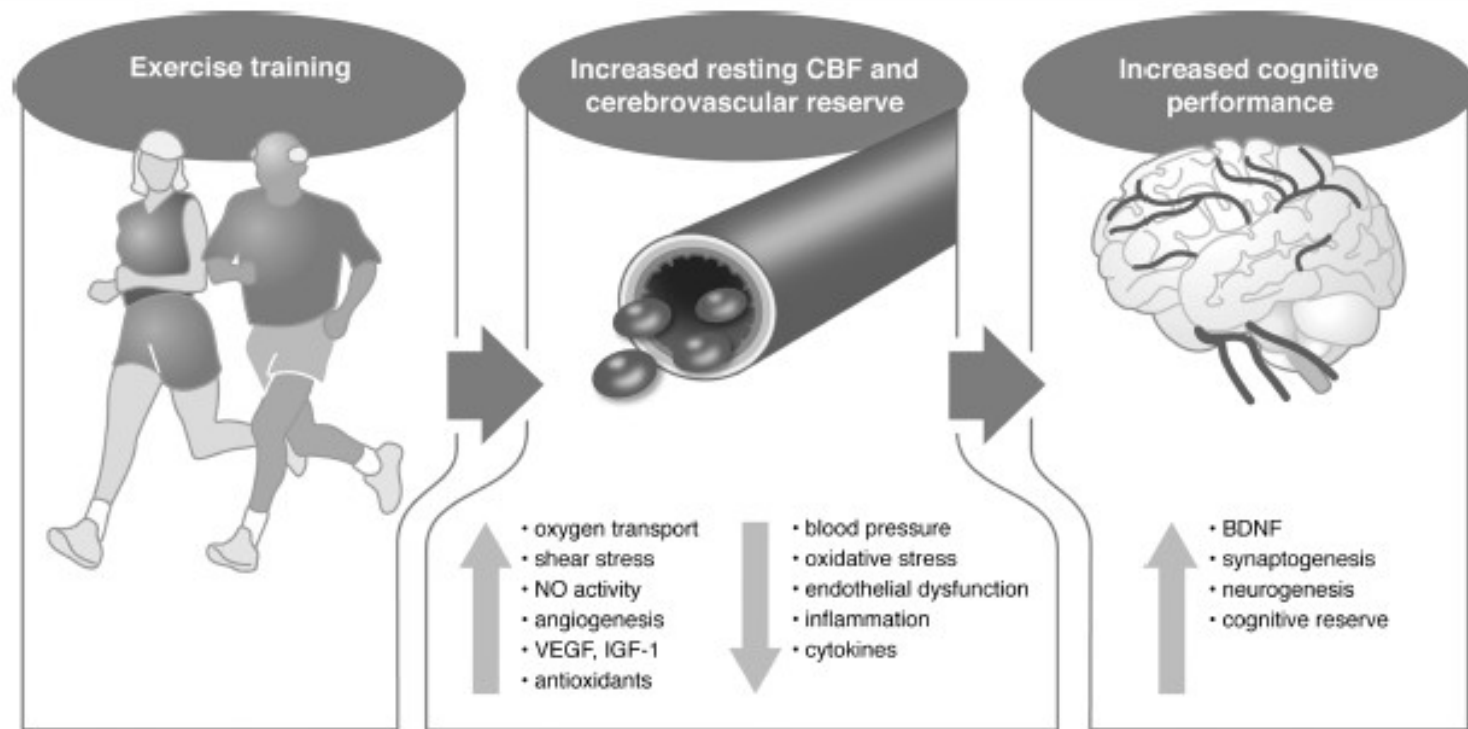
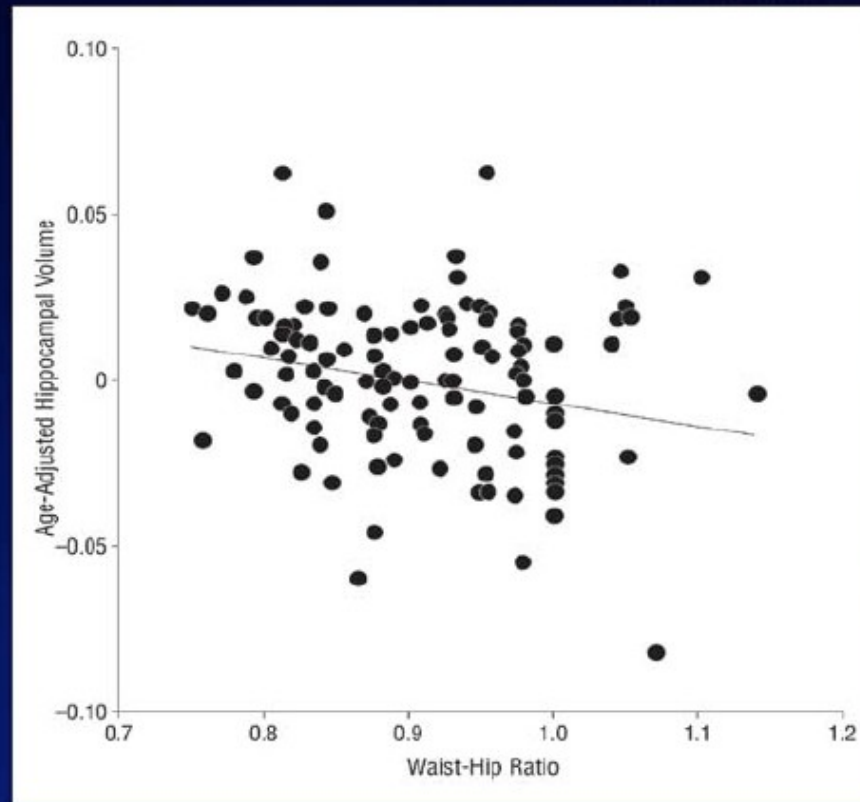


Figure 3. Proposed vascular mechanisms in the association between exercise training and increased cognitive plasticity. CBF, cerebral blood flow; NO, nitric oxide; VEGF, vascular endothelial growth factor; IGF-1, insulin-like growth factor-1; BDNF, brain-derived neurotrophic factor.

Big Belly > Small Brain

Plot of waist-hip ratio vs age-adjusted hippocampal volume



Jagust, W. et al. Arch Neurol 2005; 62:1545-1548

Diet

- Low carb
 - High sugar kills neurons – especially in the hippocampus
- Moderate healthy fats
 - Omega3
 - Omega9
 - Saturated & PUFA
- Moderate protein
- High fiber



Starch = Sugar

Starchy Foods



Bread



Cereals

=



Rice



Potatoes



1 bagel = 23 sugar cubes



=



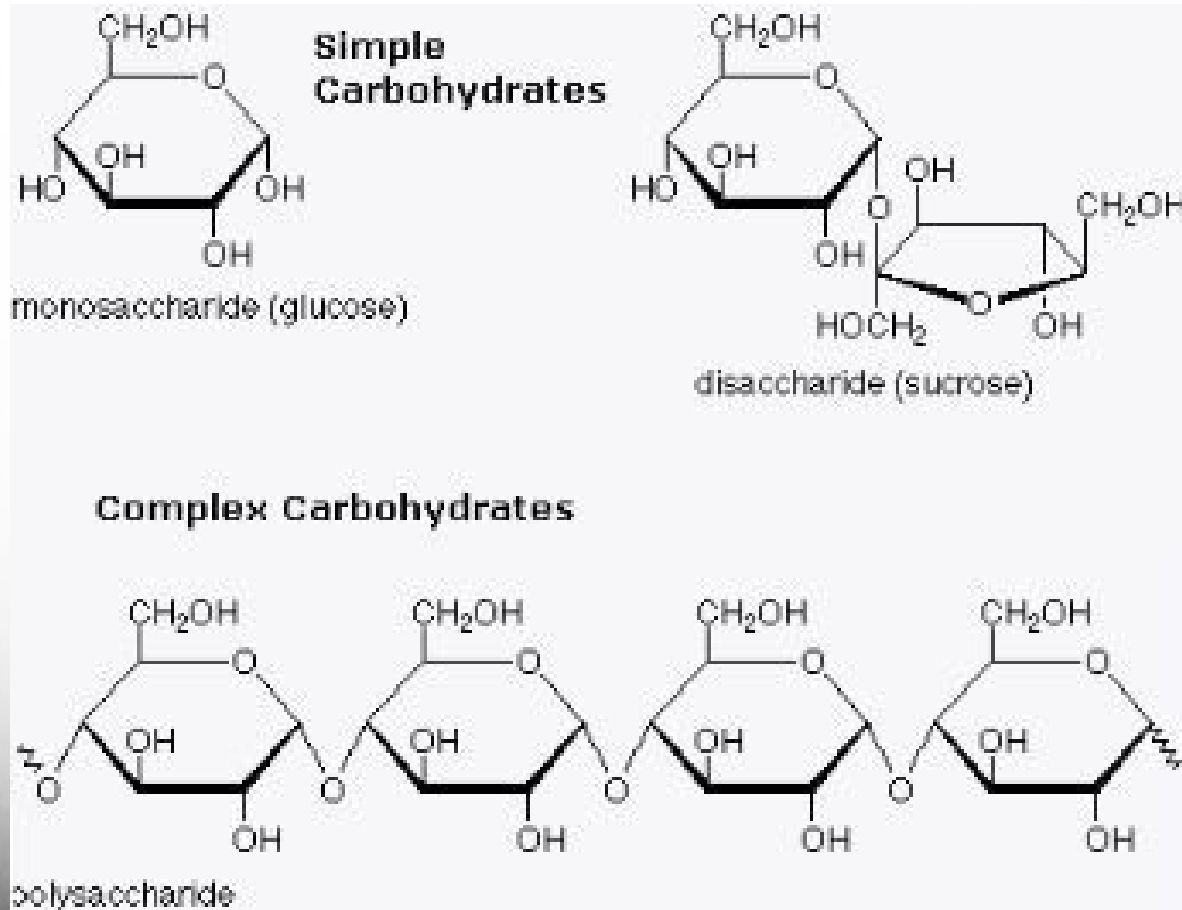
1 muffin + 29 sugar cubes



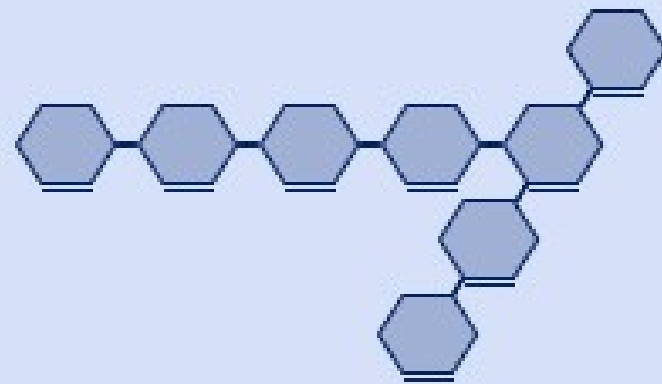
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Starch is just chained sugar

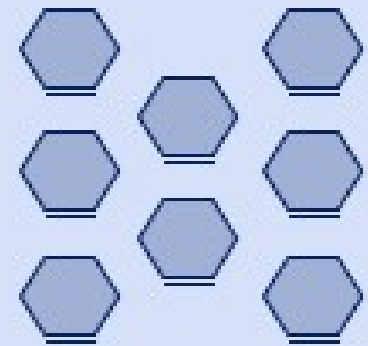


Starch is almost instantly converted into sugar



starch molecule

digestion



glucose molecules

Brain Foods

- Blueberries, blackberries, strawberries...
 - Anthocyanins stimulate neurogenesis
 - Fiber rich
- Fish oil
 - Brain is 20% DHA
- Meat (and probiotics)
 - Vit B12 critical for nerve axons



Other brain foods

- Green tea: 3+ cups/d - one of the few things that increases working memory
- Fiber foods: Apples, beans, bran, cl pears, popcorn, berries
- Potassium foods: greens, beans and sweet potatoes
- Mulberry, goji, grape seed, Lotus root



For neurotransmitters:

- Acetylcholine
 - Liver (organic) and eggs (yolks)
- Glutamate
 - Mushrooms, scallops, cheese, tomatoes,...
- Dopamine, epinephrine, norepinephrine
 - From tyrosine, an amino acid in meat protein
- Serotonin
 - From tryptophan, the least plentiful amino acid in protein: eggs, meat, dairy, etc.
 - Must eat with a carb to get across the blood-brain barrier

Supplements

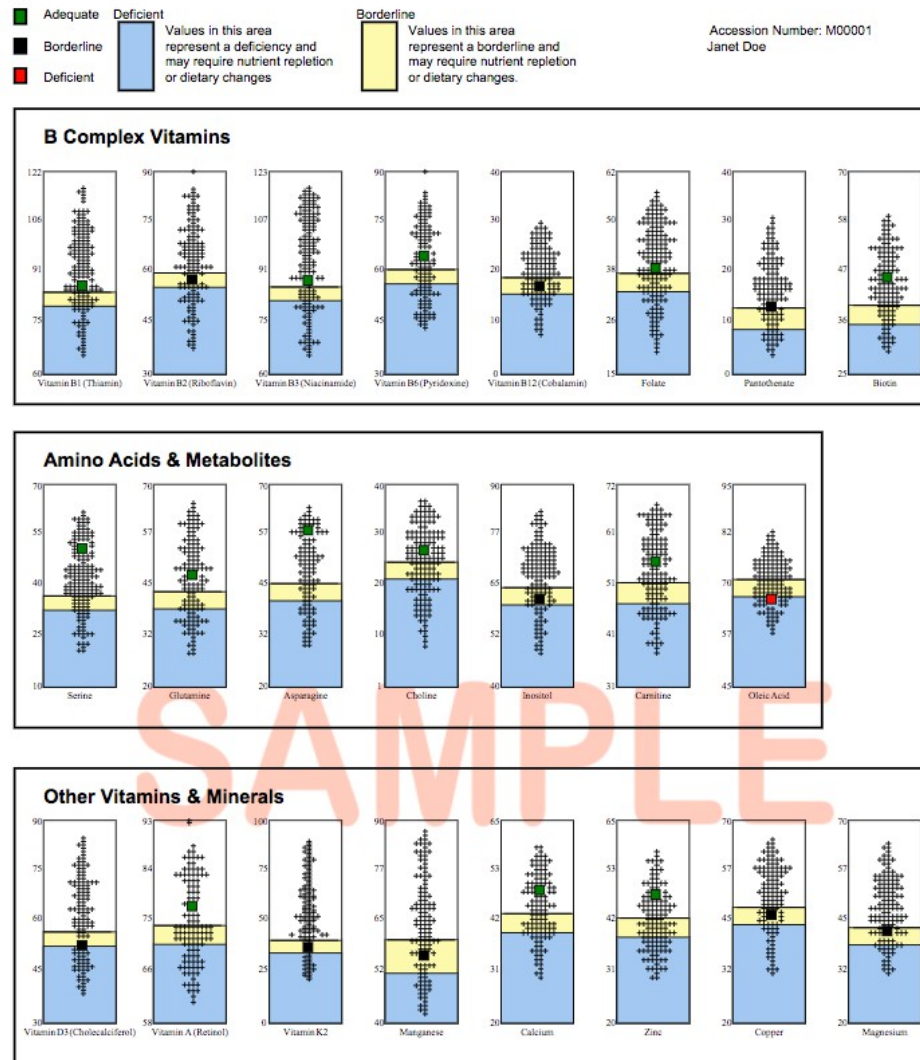
- B vitamins, especially B12 – energy metabolism
- Taurine, Tyrosine – building blocks
- melatonin or 5-HTP – for sleep
- DHEA - hormones
- Ginseng, Gingko biloba
- Quercitin (apples)
- DHA, citicoline – nerve cell membranes
- Berberine

Suggested but not proven

- Chocolate
- Vitamins C & D
- Carnosine
- Alpha lipoic acid
- Cinnamon
- Magnesium
- Colostrinin
- Lithium – in microdoses



Don't just guess



The Microbiome

- How many cells in the human body?

The Microbiome

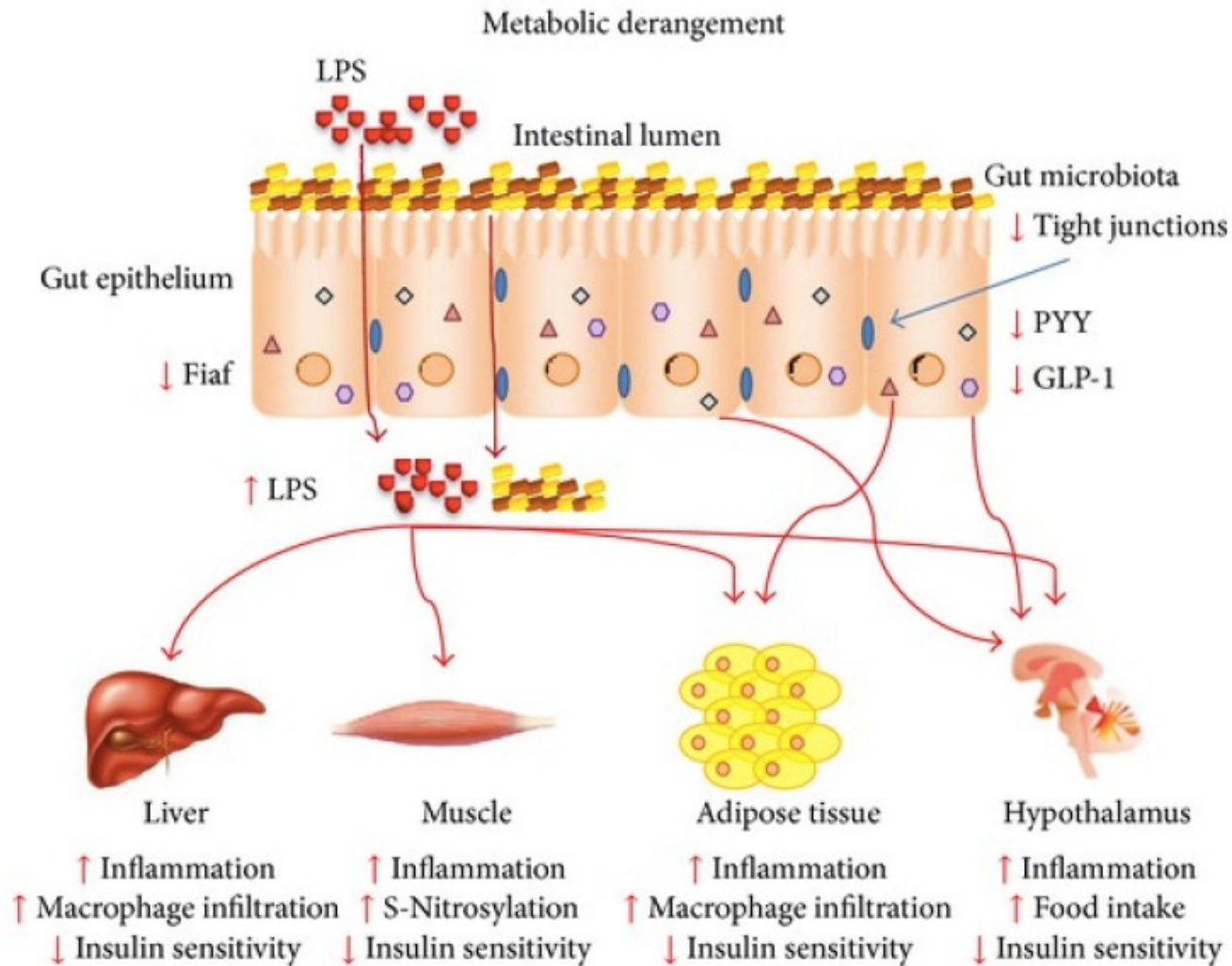
- How many cells in the human body?
 - ~30 trillion
- How many bacteria in the human GI tract?

The Microbiome

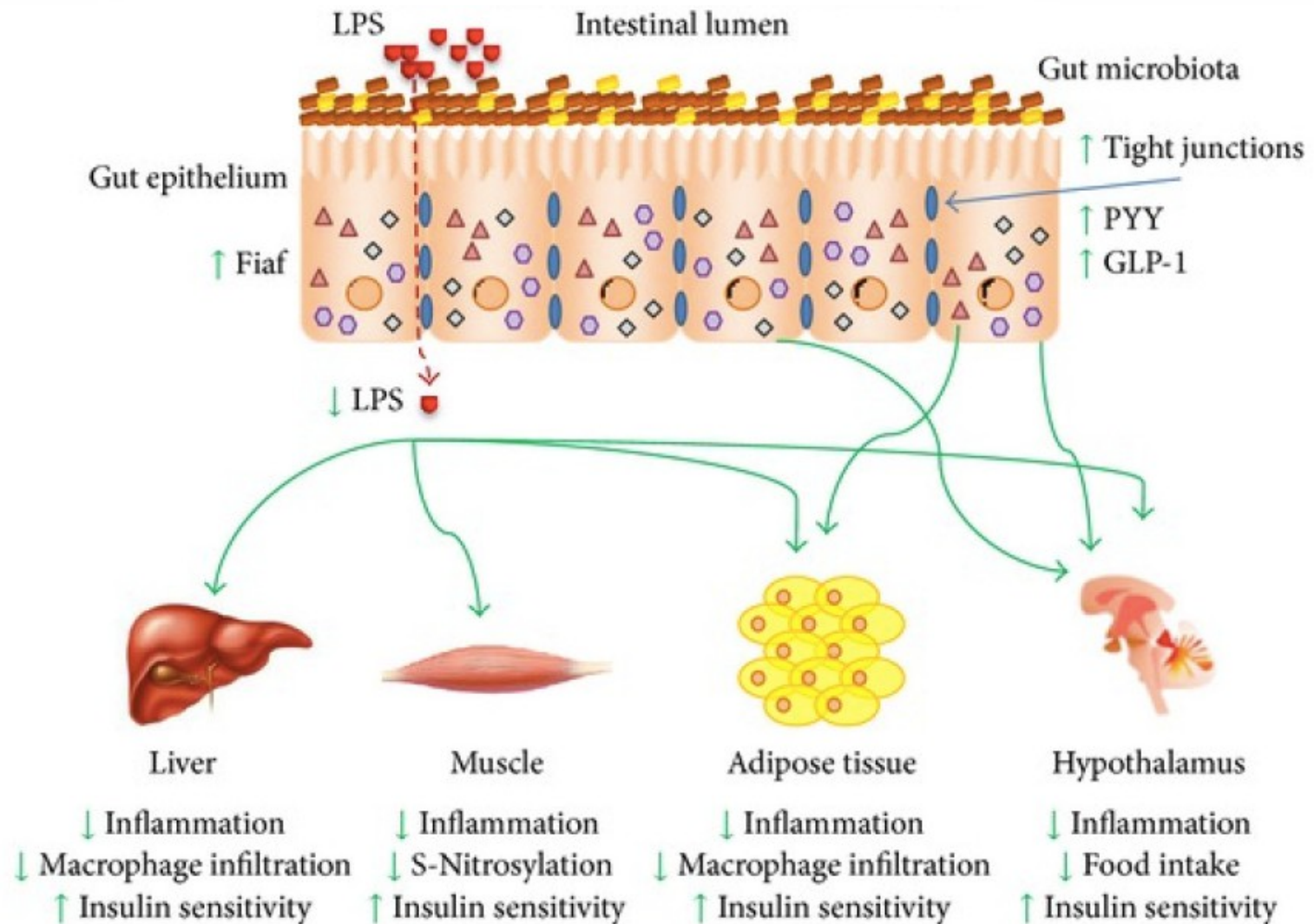
- How many cells in the human body?
 - ~30 trillion
- How many bacteria in the human GI tract?
 - ~40 trillion
- You're outnumbered 4:3 by your own bacteria!
- Better treat them nice!

If you don't they'll kill you

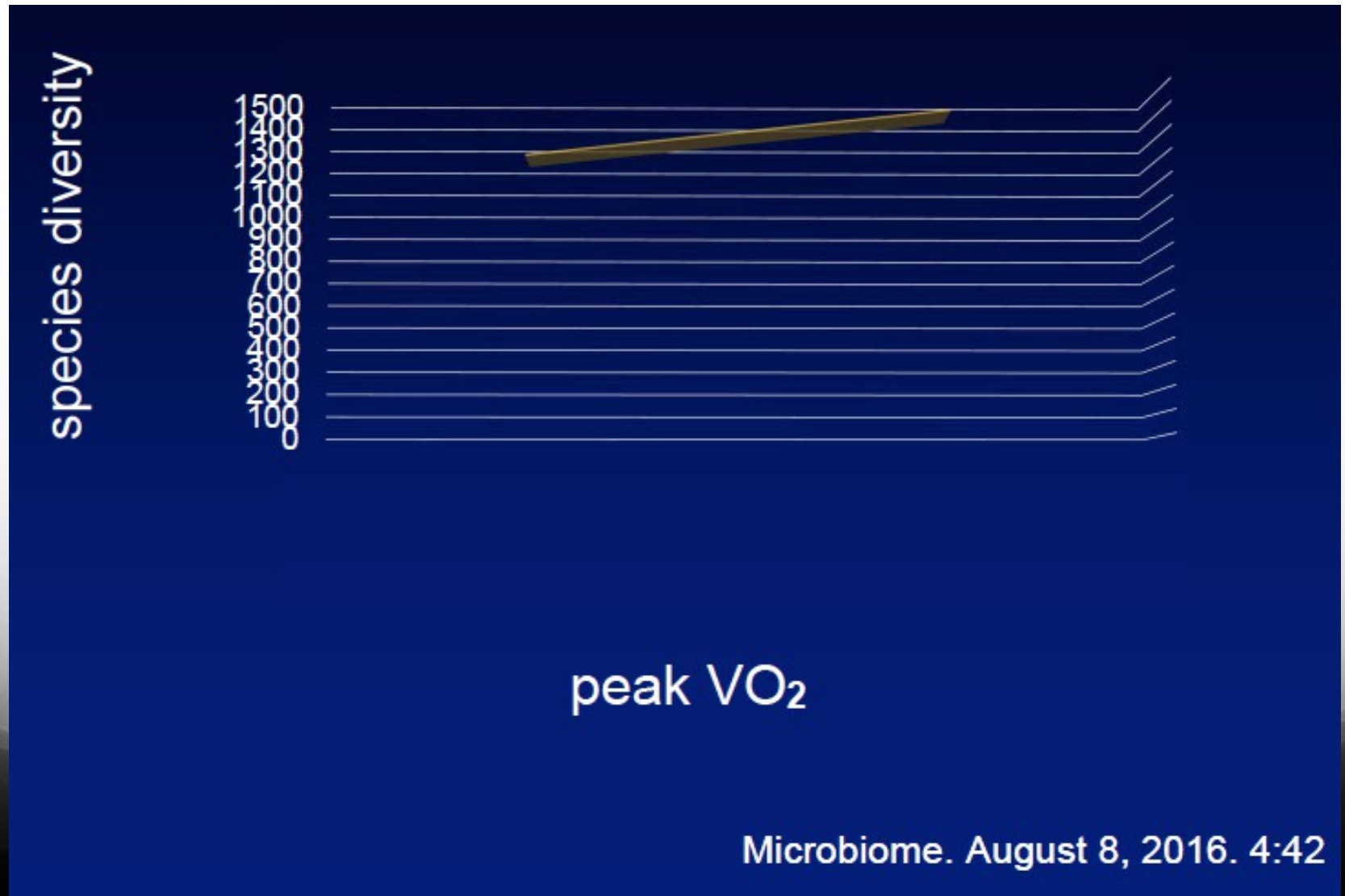
LPS comes from the gut



Good bacteria keep LPS out



How to make good bacteria



1. Exercise!

2. Seed and feed them!

3. Metformin

- 🌐 Usage to change gut flora to treat obesity and dysmetabolic syndrome considered off-label.
- 🌐 Comes as either immediate or extended-release forms (better GI tolerance). Very inexpensive.
- 🌐 Dosing: 500mg ER. 1-4 tablets per day.
 - 🌐 Start with one pill per day with food or QHS, titrate up by one pill each week. If not tolerated, return to lower dose.
- 🌐 Side effects:
 - 🌐 Nausea, vomiting, cramping
 - 🌐 Loose Stools, Diarrhea
 - 🌐 B12 depletion (strongly consider supplementation with use)
 - 🌐 Low risk of hypoglycemia (but is possible with very low CHO diets)

4. Avoid Antibiotics

Antibiotics

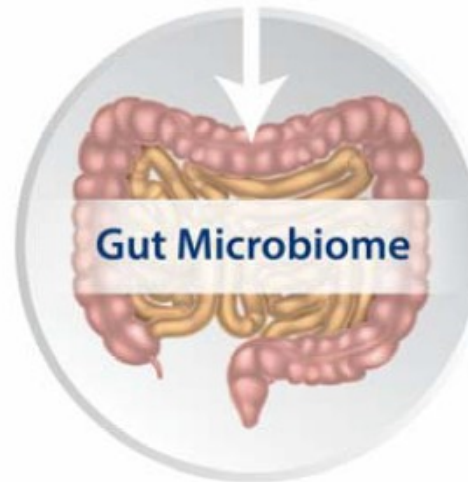
- Depletion of bacterial diversity
- Altered gene expression, protein activity and overall metabolism
- Selection for intrinsically resistant bacteria
- Selection for new mutations and gene transfers conferring resistance

Increased Susceptibility to Infections by Exogenous Pathogens or Opportunistic Commensals

- Loss of potential competitors
- Lower expression of antibacterials and IgG
- Decrease in neutrophil-mediated killing

Dysregulated Metabolism

- Elevated inflammatory signals
- Altered insulin sensitivity
- Altered metabolism of SCFA and bile acids
- Related to obesity, metabolic syndrome, diabetes



Compromised Immune Homeostasis

- Disruption of Treg/Th balance
- Elevated inflammatory signals
- Related to atopic, inflammatory and autoimmune diseases (allergies, asthma, necrotizing enterocolitis, inflammatory bowel disease, irritable bowel syndrome, etc.)

Accumulation of Antibiotic Resistances

- Establishment of resistant bacteria
- Transfer of resistance genes to pathogens
- May result in untreatable bacterial infections

Sleep

- 7-9 hours
- Sleep is when your brain “cleans up” and gets rid of toxins
- Melatonin, lavender, valerian



Trusted Touch

- Just touching between friends increases neurogenesis
- Sex combines touch with exercise – kill two birds with one stone!
- Massage and physical therapy – good for more than just achy muscles



A Rich Environment

- Read
- Write
- Actively listen to or perform music
- Play (some) games; work on puzzles
- Learn
- Do projects

Hormone Replacement

- Women – estrogen
 - Necessary for vascular health
 - Must start within 10 years of menopause or < age 60
 - ~34% reduction in Alzheimers in women starting BHRT during perimenopause
- Men – testosterone
 - Is converted into estrogen
 - Same benefits as women
 - Improves mood
 - Improves visuospatial cognition

Things to Avoid

- Brain cells are fragile.
- We need to protect them as much as possible.

Trauma

- Even minor concussions cause significant brain cell death
- If you run, learn how to do it correctly
- Don't (let your kids) play football or soccer
- Always wear seatbelts, helmet, etc. when appropriate



Toxins

- Food –
mercury (fish),
pesticides,
hormones ...
- Environmental
– lead,
pollution ...
- Medical –
mercury fillings,
radiation, drugs



Toxic Meds

- Antibiotics
- Proton Pump Inhibitors
- NSAIDS

Association of Proton Pump Inhibitors With Risk of Dementia

Risk of dementia in regular users of PPI drugs was increased by 44%.

Chronic Stress

- Kills cells in the hippocampus
 - Inhibits memory formation, reasoning and focus
- Get rid of toxic relationships and situations
- Mindfulness – meditation, prayer, etc. is one of the few ways to improve working memory
- *Bacopa monnieri* - neuroprotective



Radiation

- Medical X-rays or scans
- Microwave radiation
- High altitude flying

Take Home Points

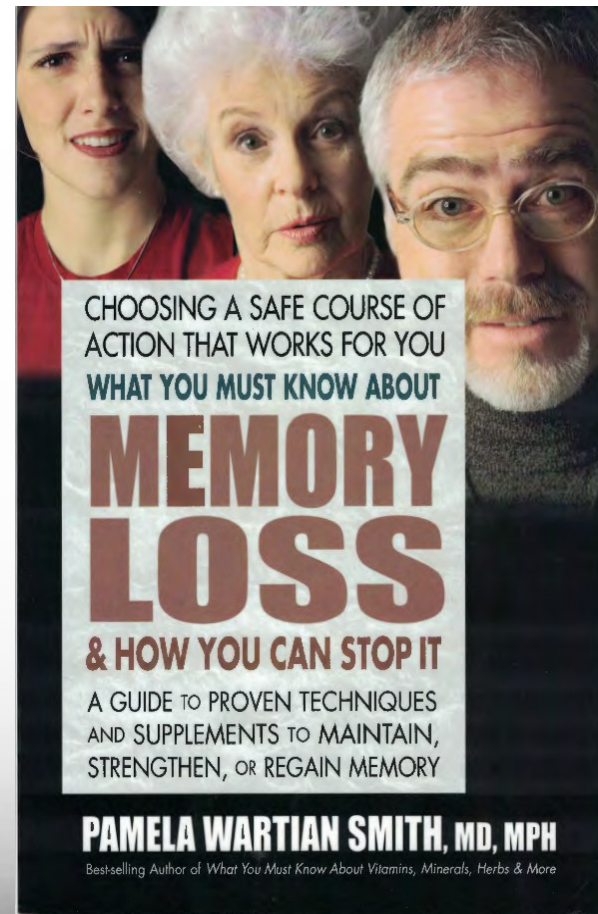
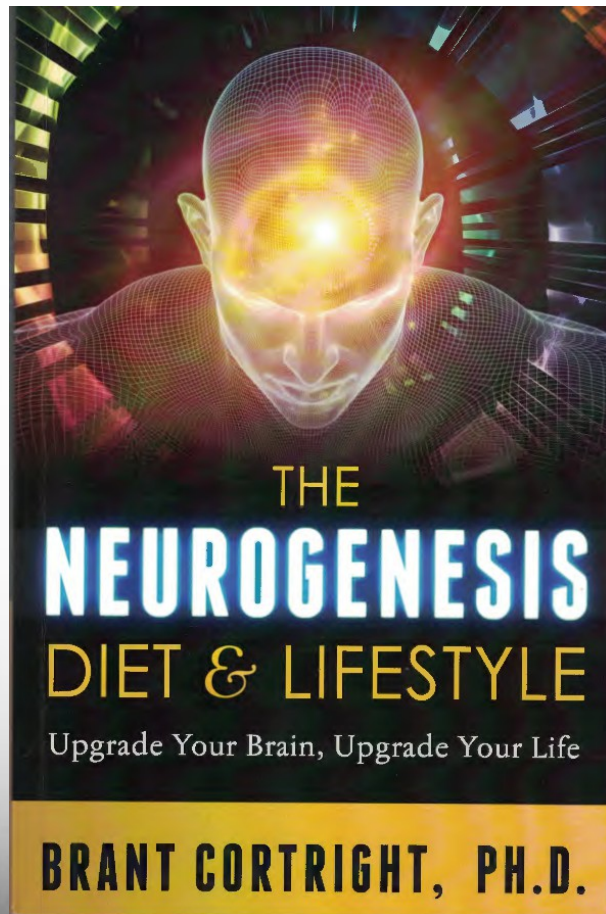
Do:

- Exercise 30+ minutes a day
- Eat blueberries, fish (not fried), meat
- Chill – mindfulness, meditation, prayer, some yoga
- Hug somebody
- Think
 - Read – books, magazines, journals – longer is better
 - Write – books, emails, poetry, a diary, ...
 - Talk – discuss, chat, call ...
 - Play – games, instruments, puzzles
 - Listen – podcasts, music, webinars ...

Don't:

- Eat sugar, potatoes, rice, trans-fats, or bread
- Watch TV
- Be a hermit
- Do only one or few kinds of activities
- Run marathons or engage in extreme sports
- Drink alcohol
- Take prescription sleeping pills, antibiotics, PPIs

Resources:



This Just Out:

Your best supplement reference



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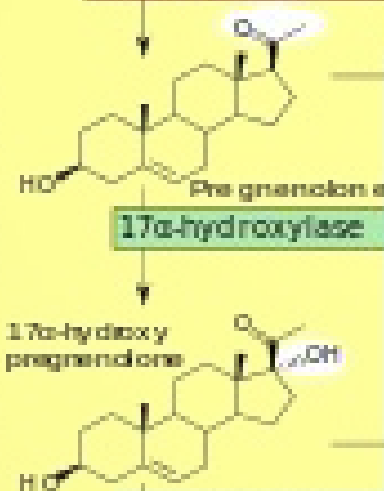
Also good:

Questions?

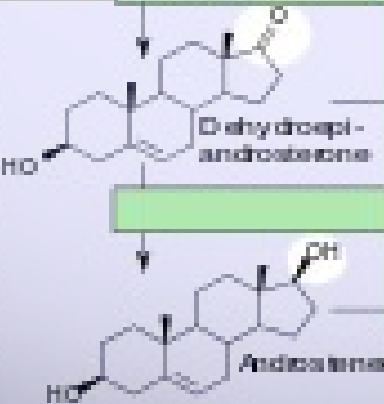


C-cholesterol side-chain cleavage enzyme

Pregnenolone (21 carbons)

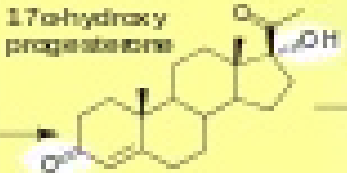
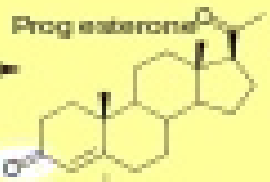


17,20 lyase

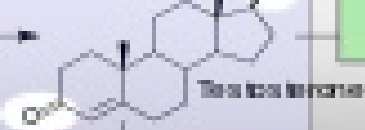


Androgens (19 carbons)

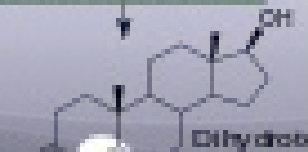
3 β -hydroxysteroid dehydrogenase (3 β -HSD)



17 β -HSD



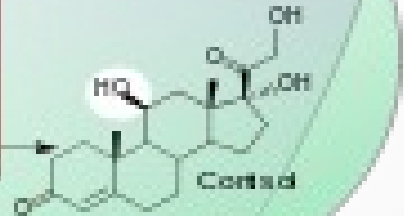
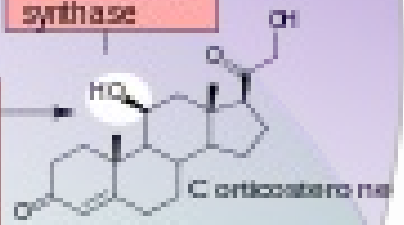
5 α -reductase



21-hydroxylase



11 β -hydroxylase



Glucocorticoids (21 carbons)

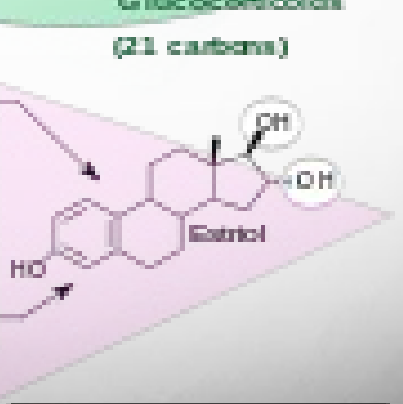
Aldosterone synthase



Aromatase



(liver and placenta)



Estrogens (18 carbons)

Cellular location of enzymes

Mitochondria

Smooth endoplasmic