Alzheimer's Update & Boosting Brain Health

Craig Curtis, M.D.

Sharon Morse Building
The Villages, FL

PERSONAL FINANCE | RETIREMENT

How Undiagnosed Cognitive Decline Eats Into Seniors' Retirement Savings

Research finds retirees who suffer severe memory loss face tens of thousands of dollars in lost savings, primarily through bad investments

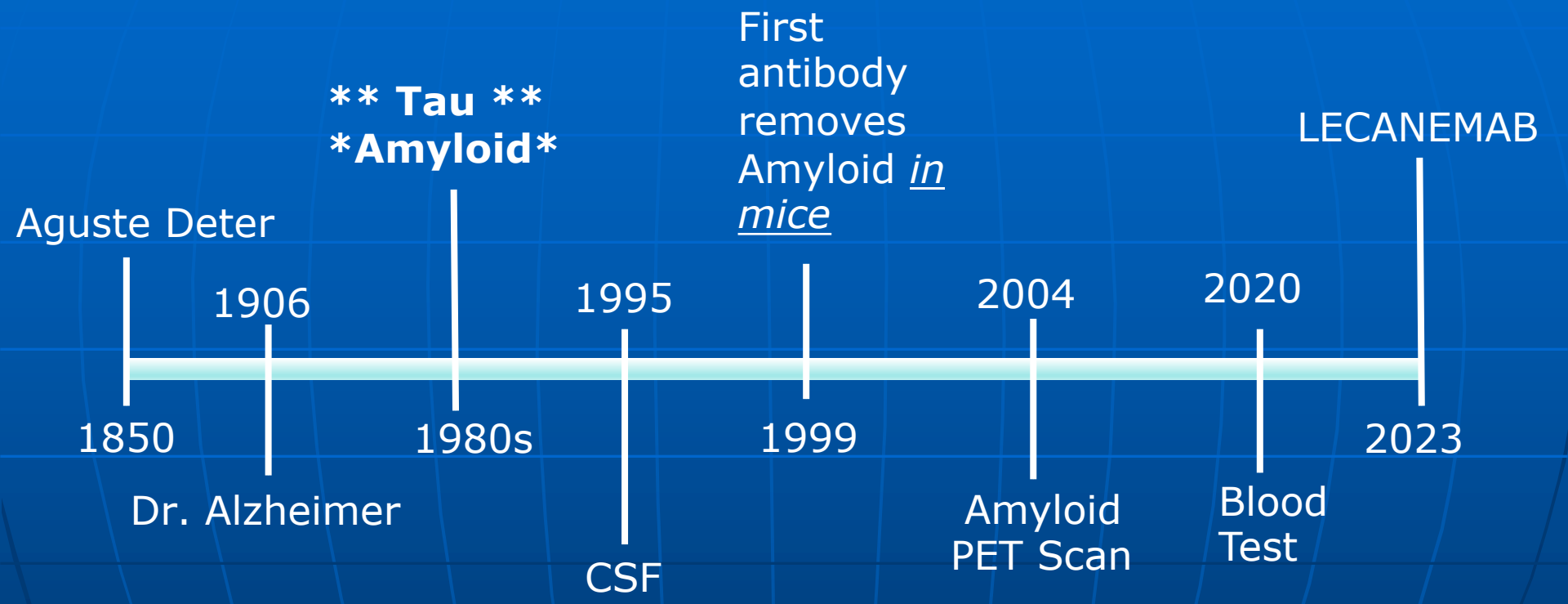
By Nick Fortuna

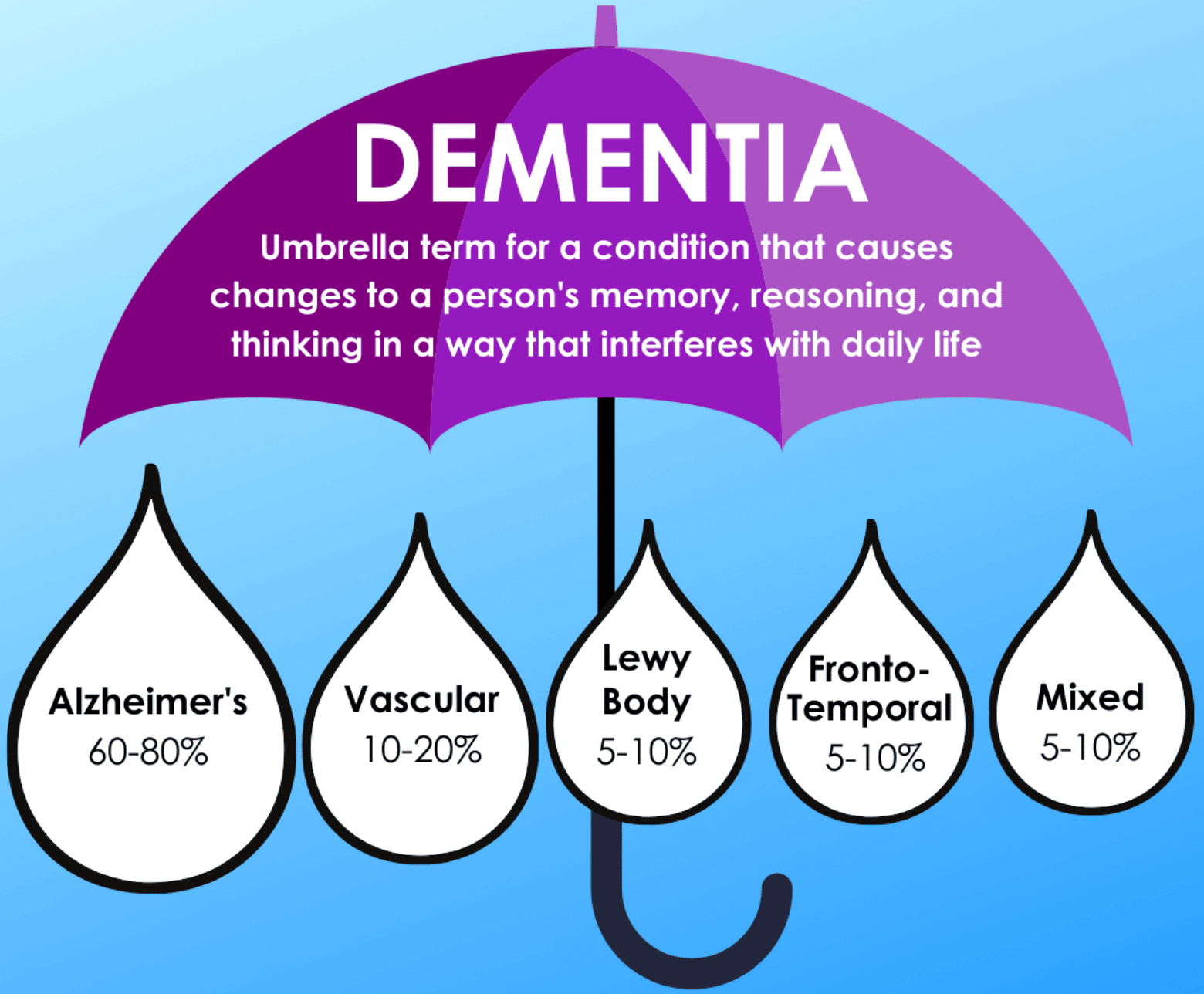
Nov. 3, 2024 10:00 am ET

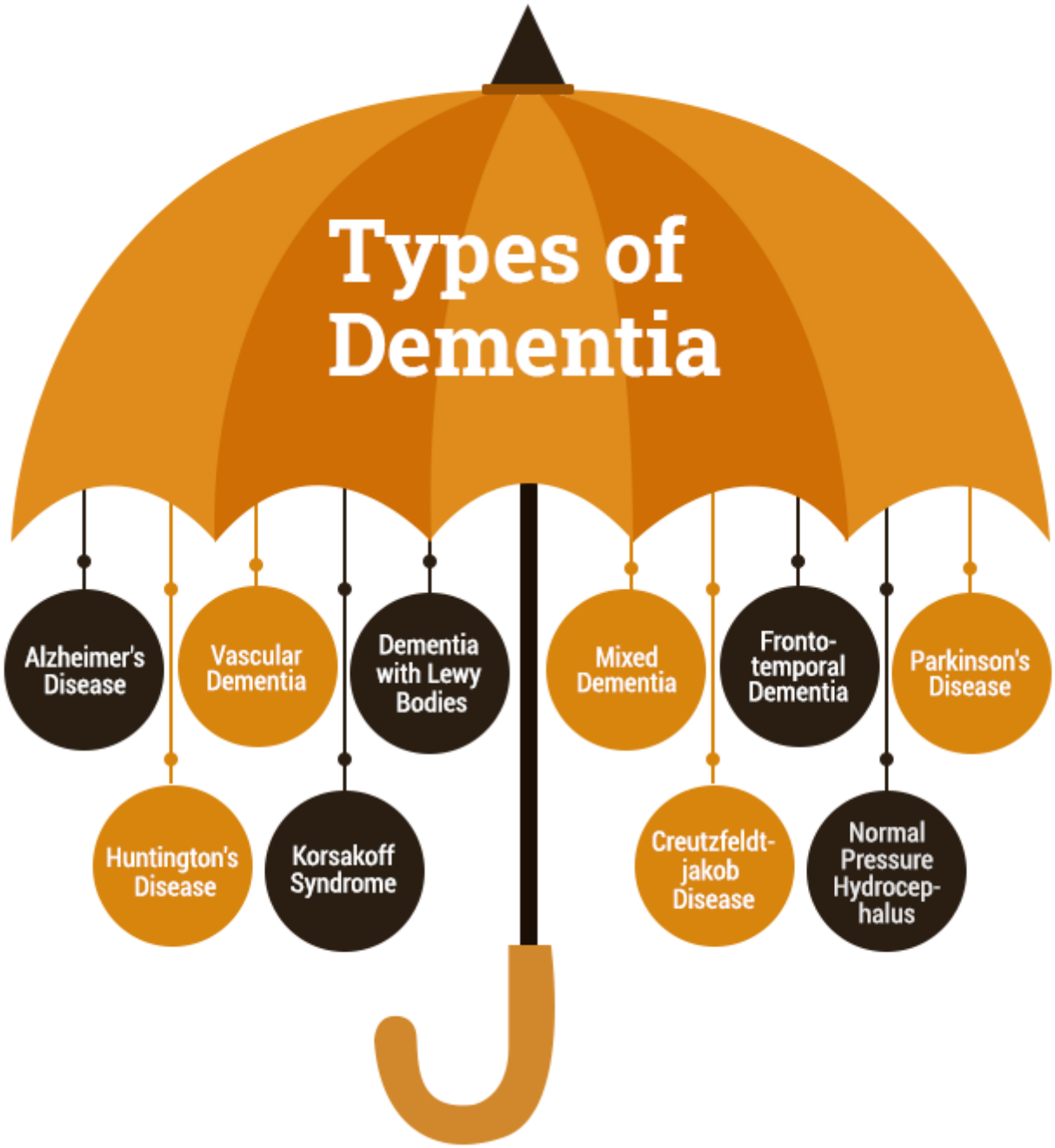
ILLUSTRATION: JON KRAUSE

Undiagnosed cognitive decline can cost seniors tens of thousands of dollars in retirement savings through bad investments or financial scams, according to new research.

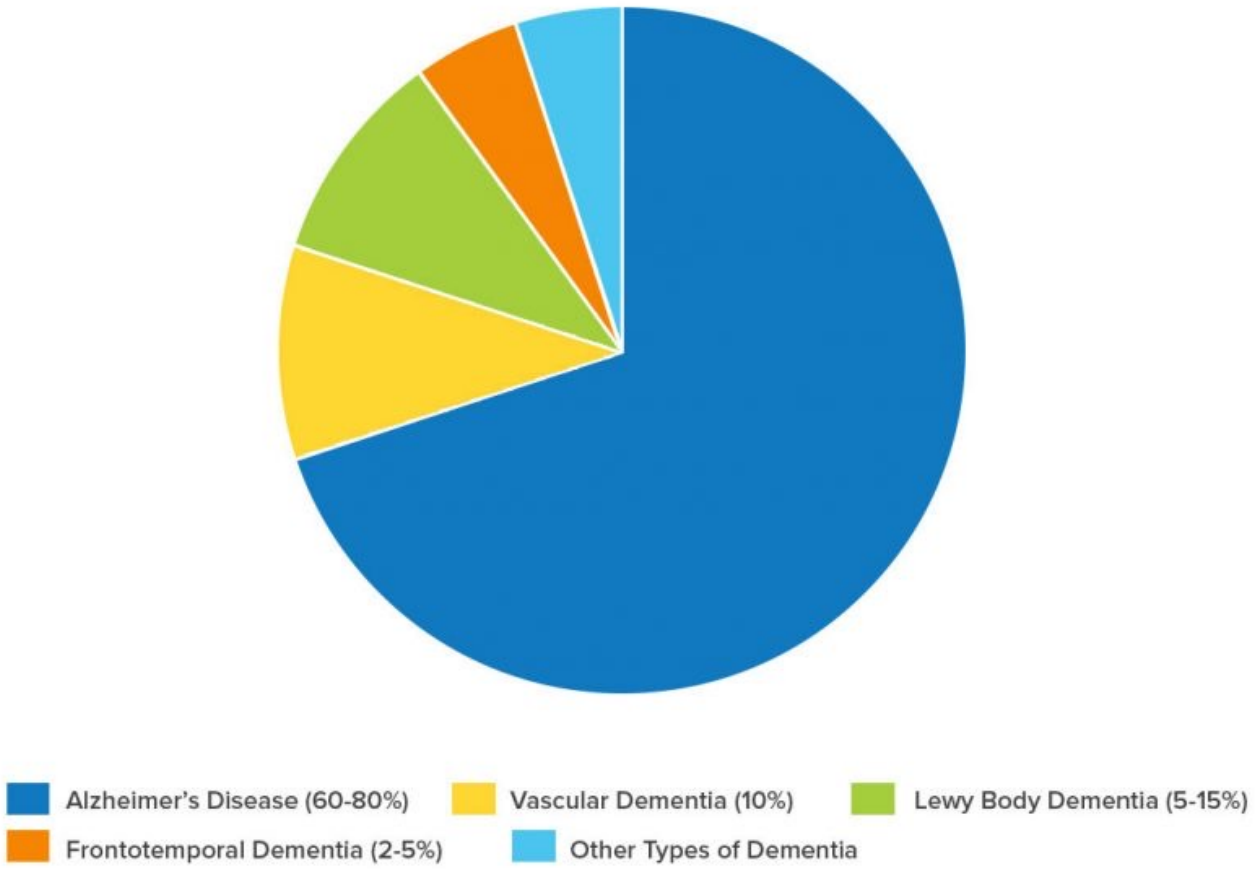
Alzheimer's Timeline




DEMENTIA
Umbrella term for a condition that causes changes to a person's memory, reasoning, and thinking in a way that interferes with daily life
Alzheimer's
60-80%
Vascular
10-20%
Lewy Body
5-10%
Fronto-Temporal
5-10%
Mixed
5-10%


Types of Dementia
Alzheimer's Disease
Vascular Dementia
Dementia with Lewy Bodies
Mixed Dementia
Fronto-temporal Dementia
Parkinson's Disease
Huntington's Disease
Korsakoff Syndrome
Creutzfeldt-jakob Disease
Normal Pressure Hydroceph-halus

Different Types of Dementia (by %)



Alzheimer's Risk Factors

- Risk Factors:
  - Age *#1 by far*
  - Genetics

US over 65

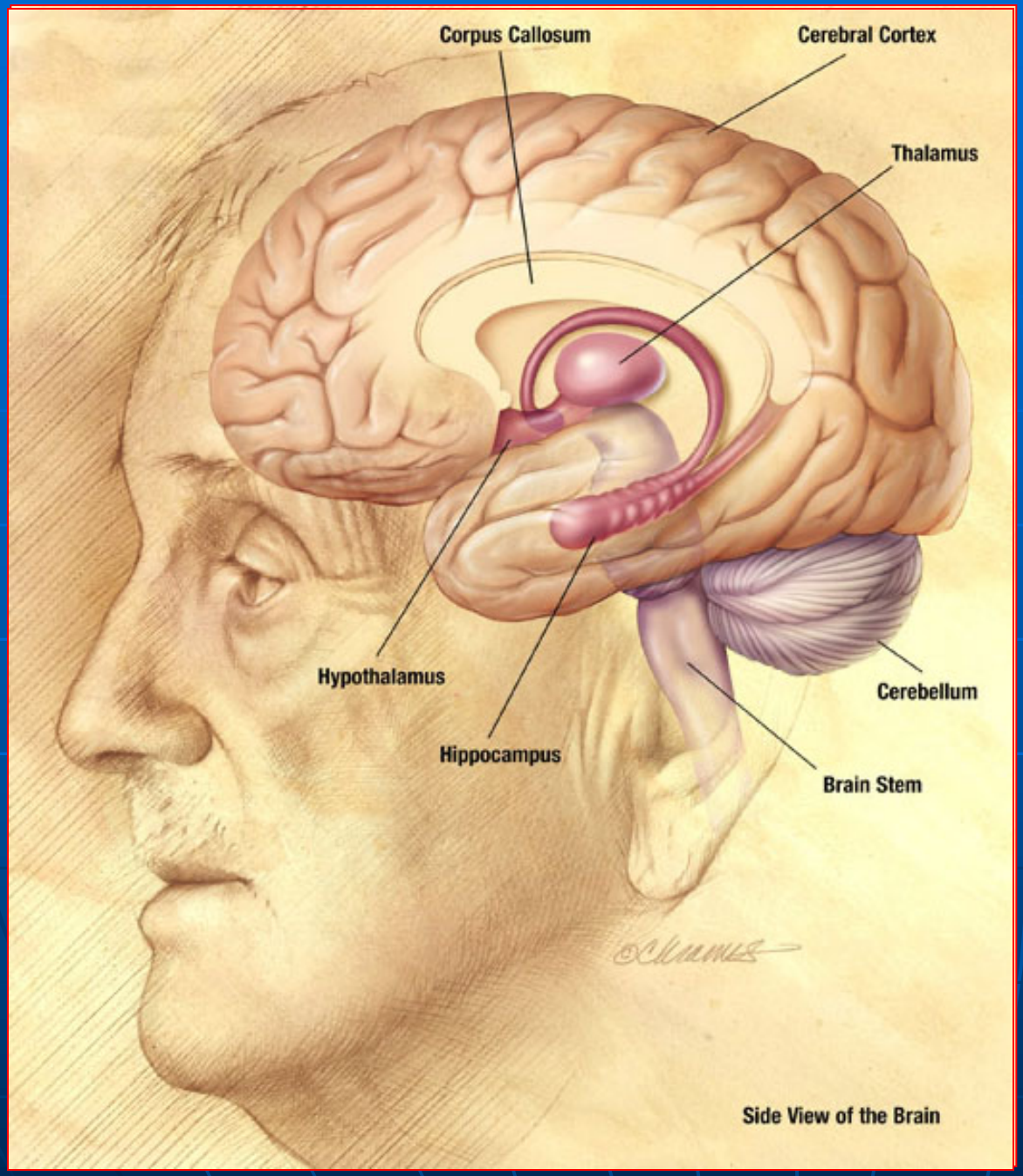
60,000,000

90,000,000

Alzheimer's risk factors

- Genetics

- 70% of all AD related to genes



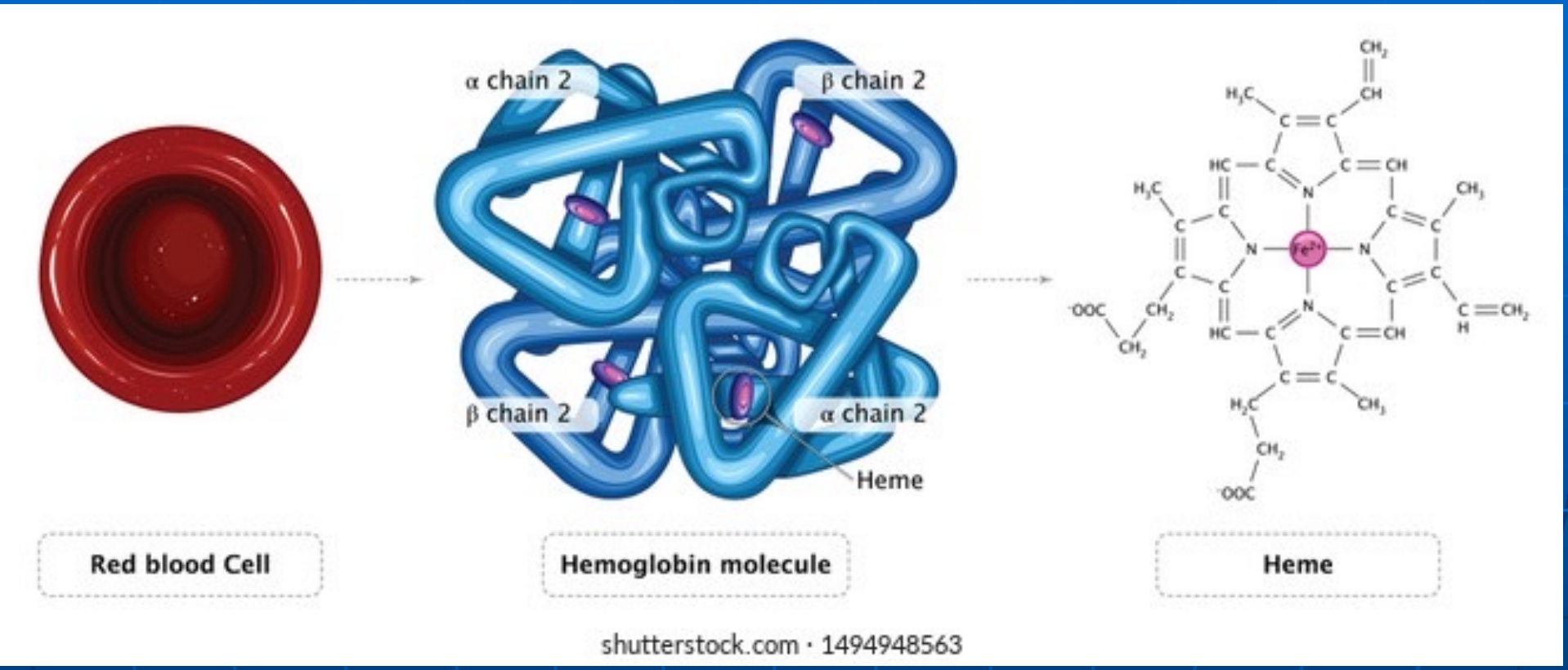
Inside the Human Brain

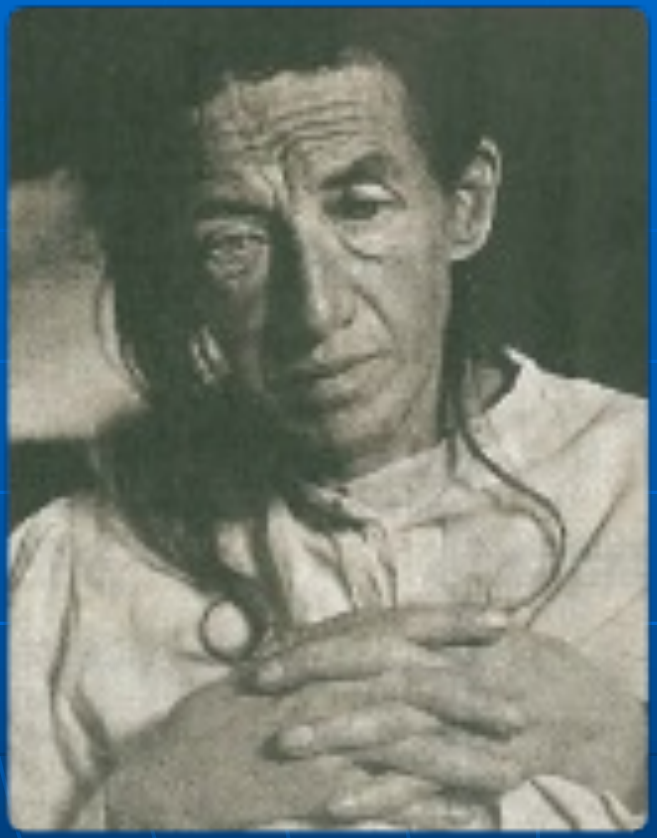
To understand Alzheimer's disease, it's important to know a bit about the brain…

The Brain's Vital Statistics

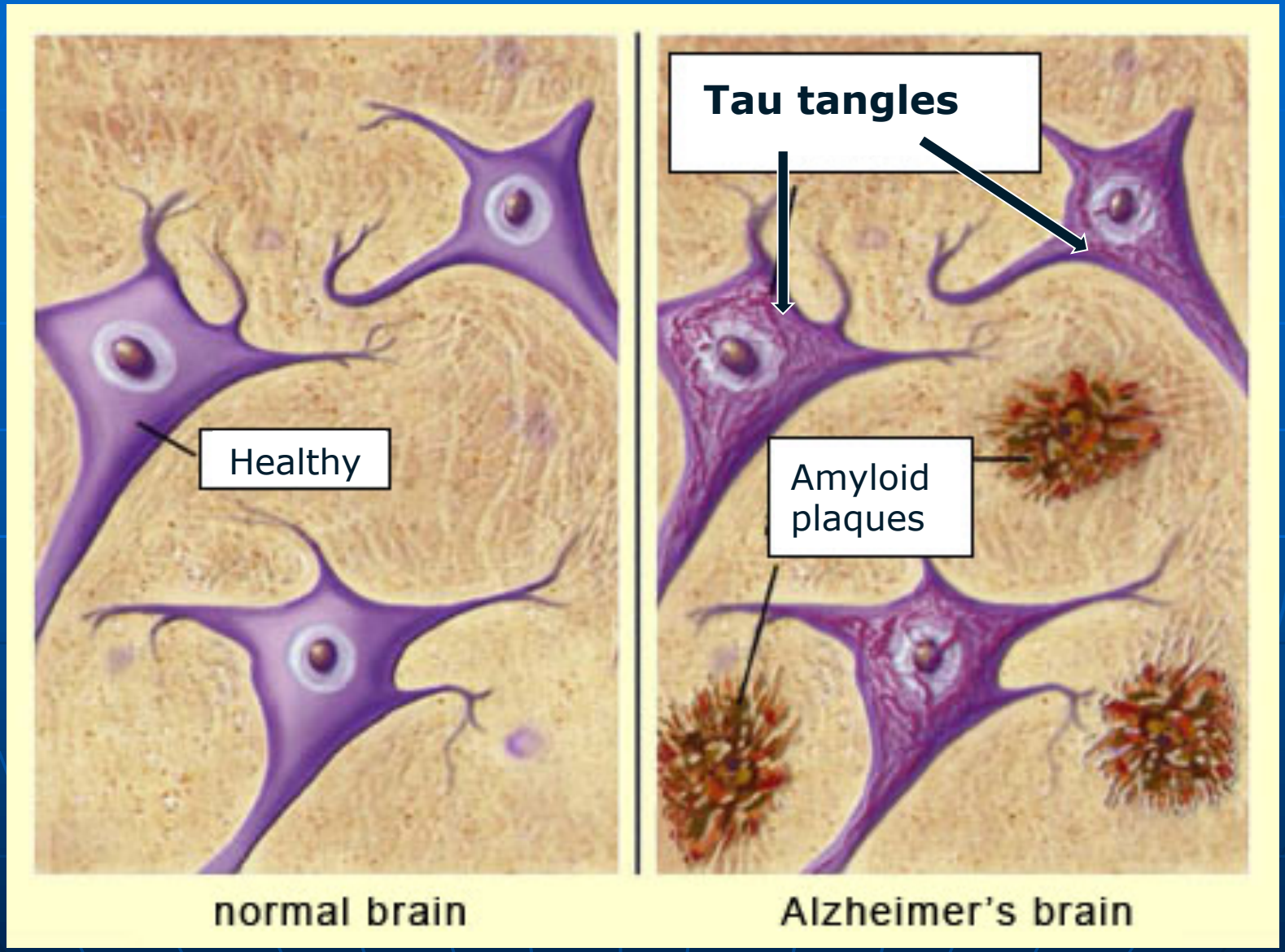
- Adult weight: about 3 pounds
- Adult size: a medium cauliflower
- Number of neurons: 100,000,000,000 (100 billion)
- Number of synapses (the gap between neurons): 100,000,000,000,000 (100 trillion)

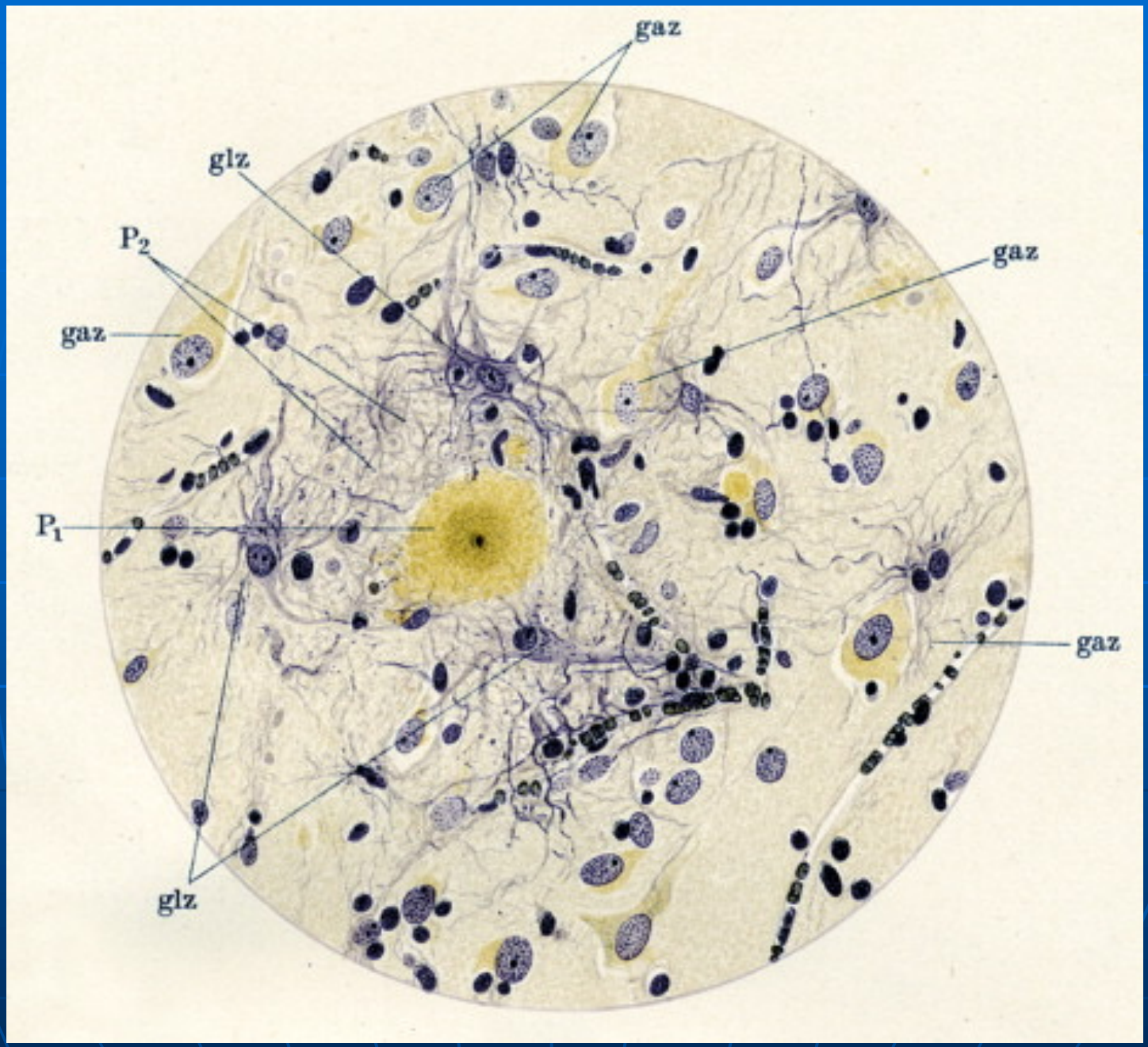
Example: Protein





Dr. Alzheimer: what he saw 1905




gaz
glz
P2
gaz
gaz
P1
gaz
glz

What are Amyloid & Tau?

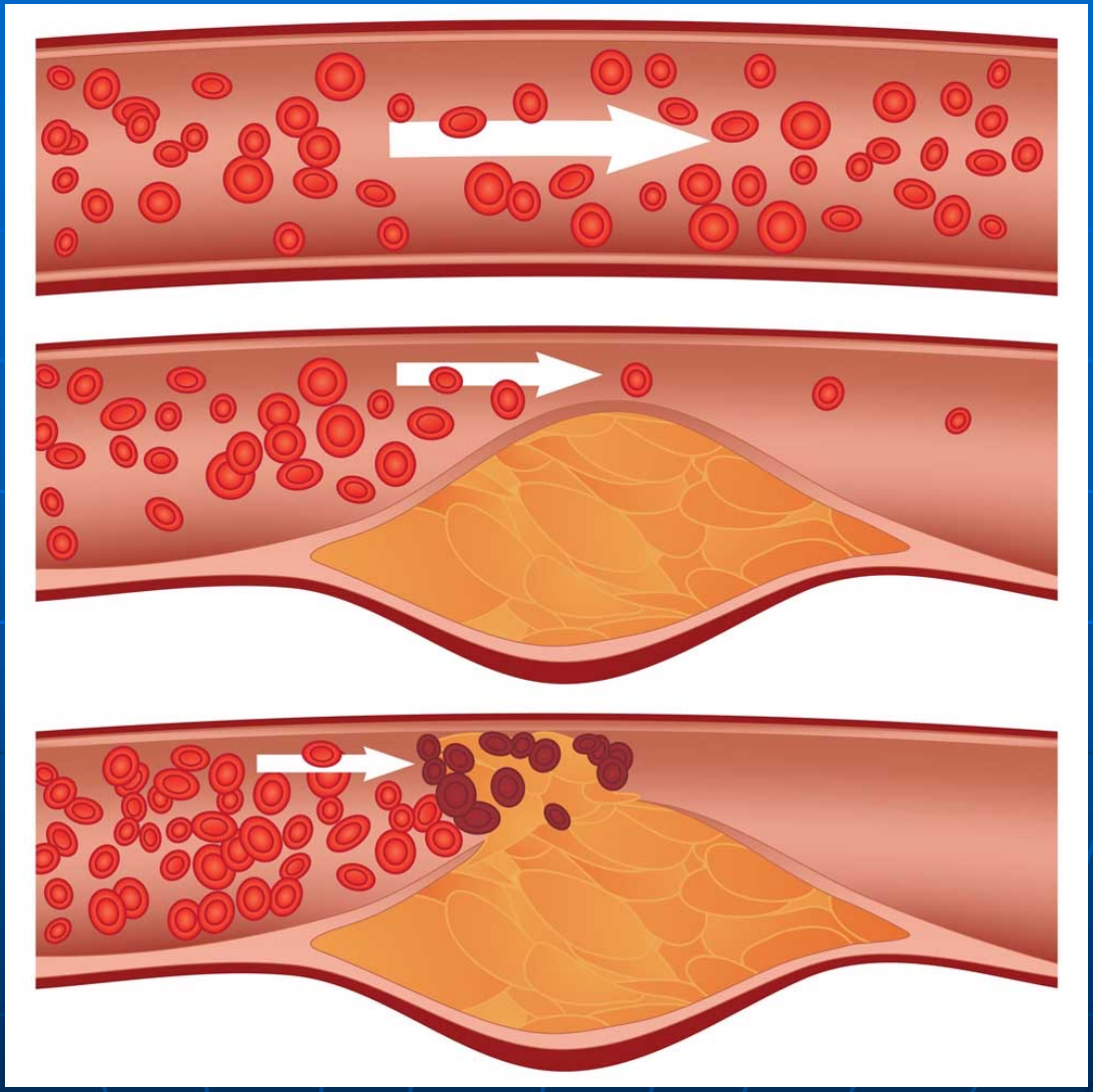
- Normal brain proteins that for some unknown reason, clump together causing brain cells to die off

Cholesterol plaque progression

Year 0

Year 10

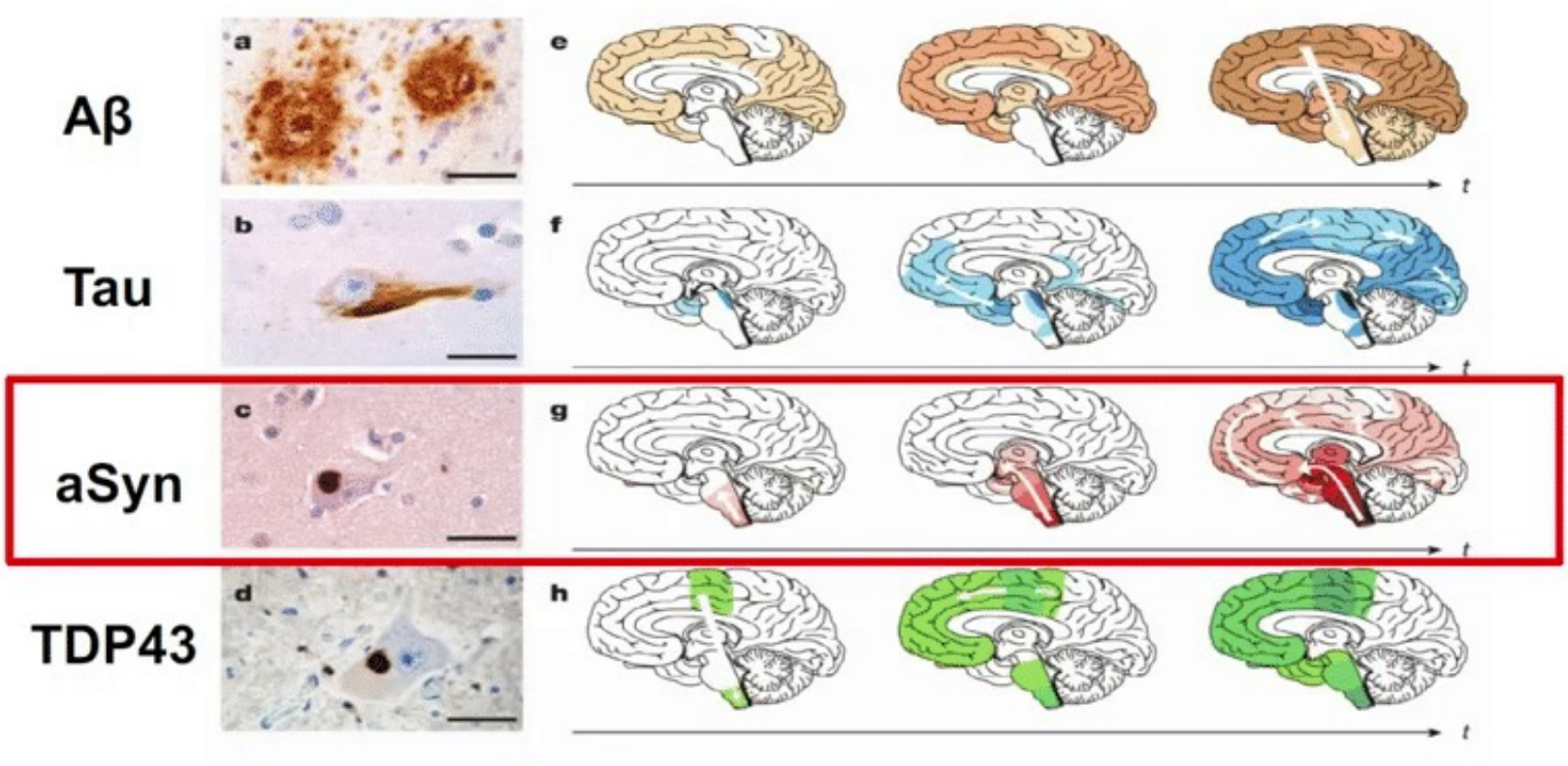
Year 20



Amyloid Cascade

- Theory introduced in 1991

Protein Pathology in Neurodegenerative Disorders



Jucker and Walker 2013

Amyloid “Spark” & Tau “Fire”

- First proposed in 2001 by Thal in 2001
- Introducing Amyloid into Tau mice led to rapid 5x increase in Tau

Formation of Neurofibrillary Tangles in P301L Tau Transgenic Mice Induced by Aβ42 Fibrils

J. Gotz, F. Chen, J. van Dorpe, and R. M. NitschAuthors Info & Affiliations

Science

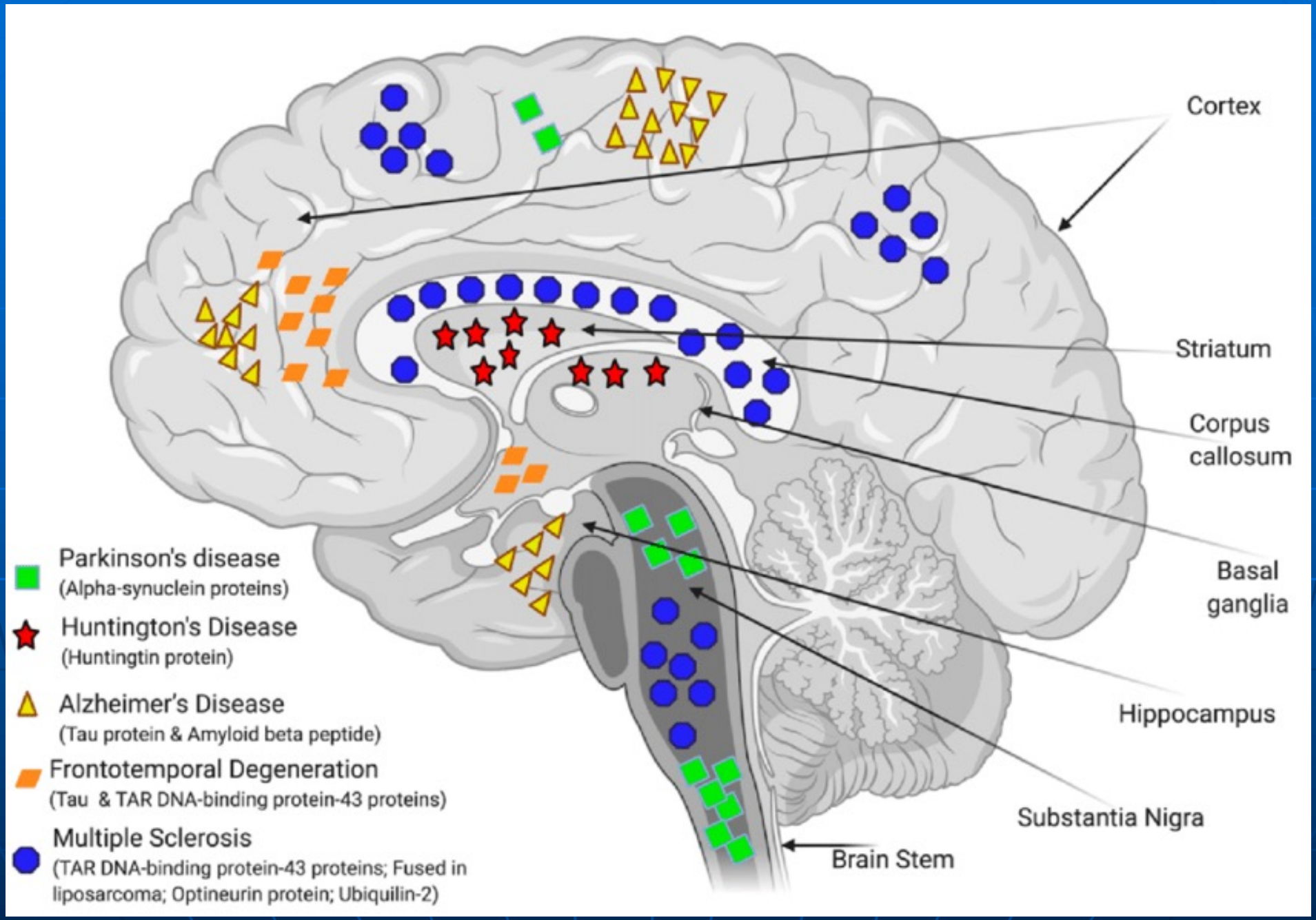
24 Aug 2001

Vol 293, Issue 5534

pp. 1491-1495

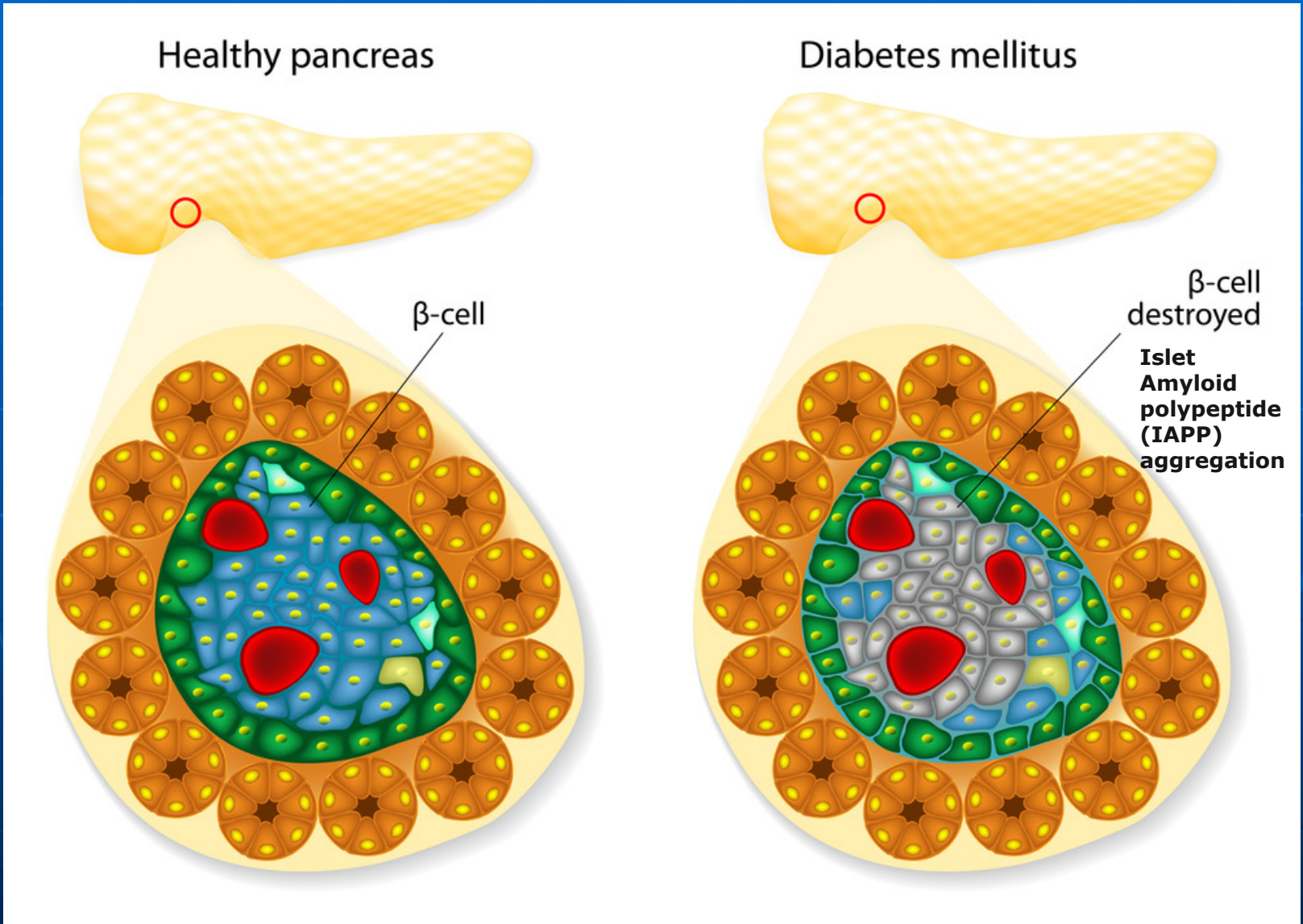
Proteins Misfolding and Clumping ??

- Alzheimer's (Amyloid & Tau)
- Cataracts (crystallin AB)
- PD, DLB (alpha synuclein)
- Lou Gehrig's (TDP-43)
- FTD (TDP-43)

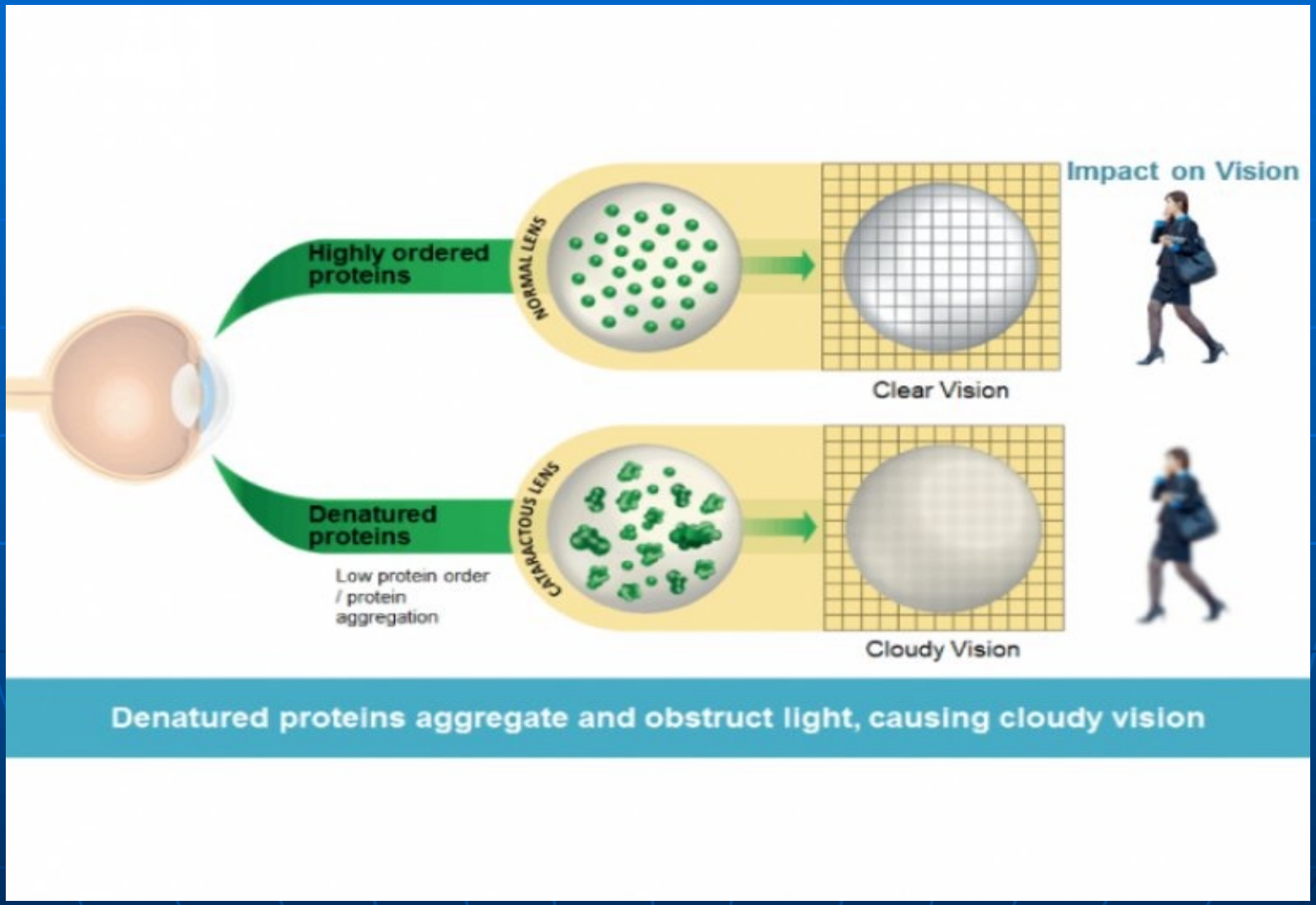

Cortex
Striatum
Corpus callosum
Basal ganglia
Hippocampus
Substantia Nigra
Brain Stem
Parkinson's disease
(Alpha-synuclein proteins)
Huntington's Disease
(Huntingtin protein)
Alzheimer's Disease
(Tau protein & Amyloid beta peptide)
Frontotemporal Degeneration
(Tau & TAR DNA-binding protein-43 proteins)
Multiple Sclerosis
(TAR DNA-binding protein-43 proteins; Fused in liposarcoma; Optineurin protein; Ubiquilin-2)

- Other diseases caused by ”normal” proteins clumping together (NOT related to Alzheimer’s)
  - Diabetes
  - Cataracts

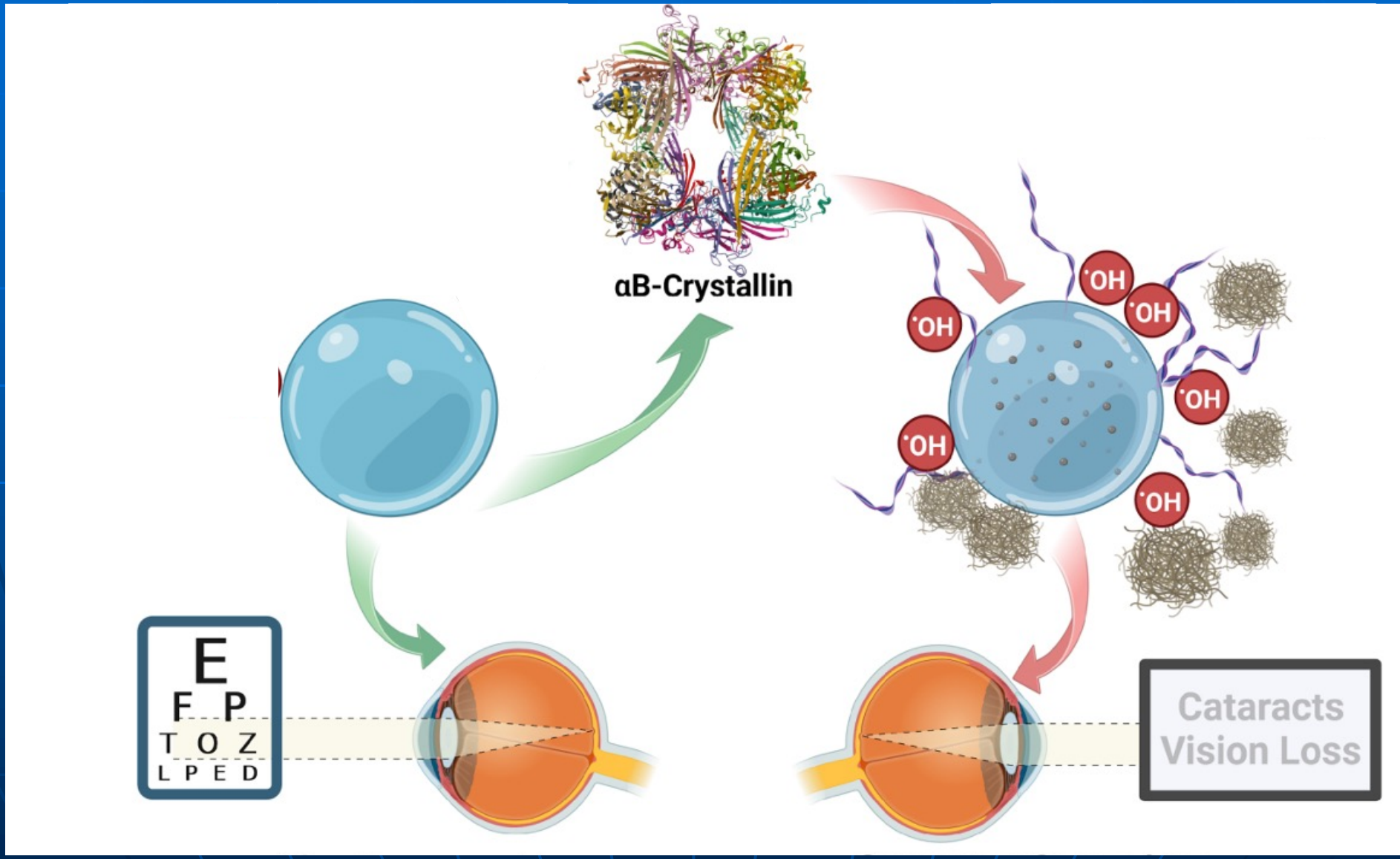
IAPP Protein Aggregation in Diabetes

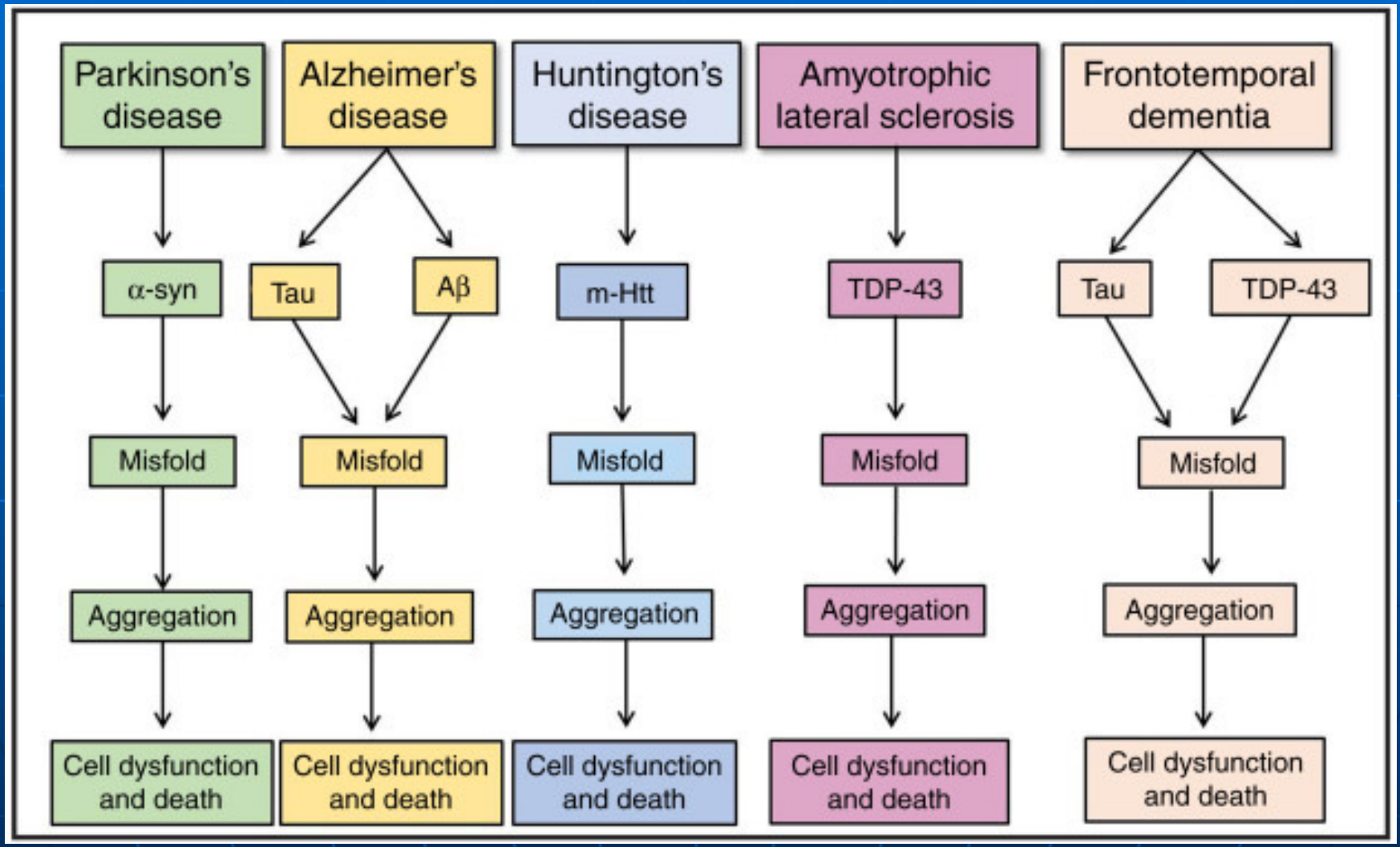


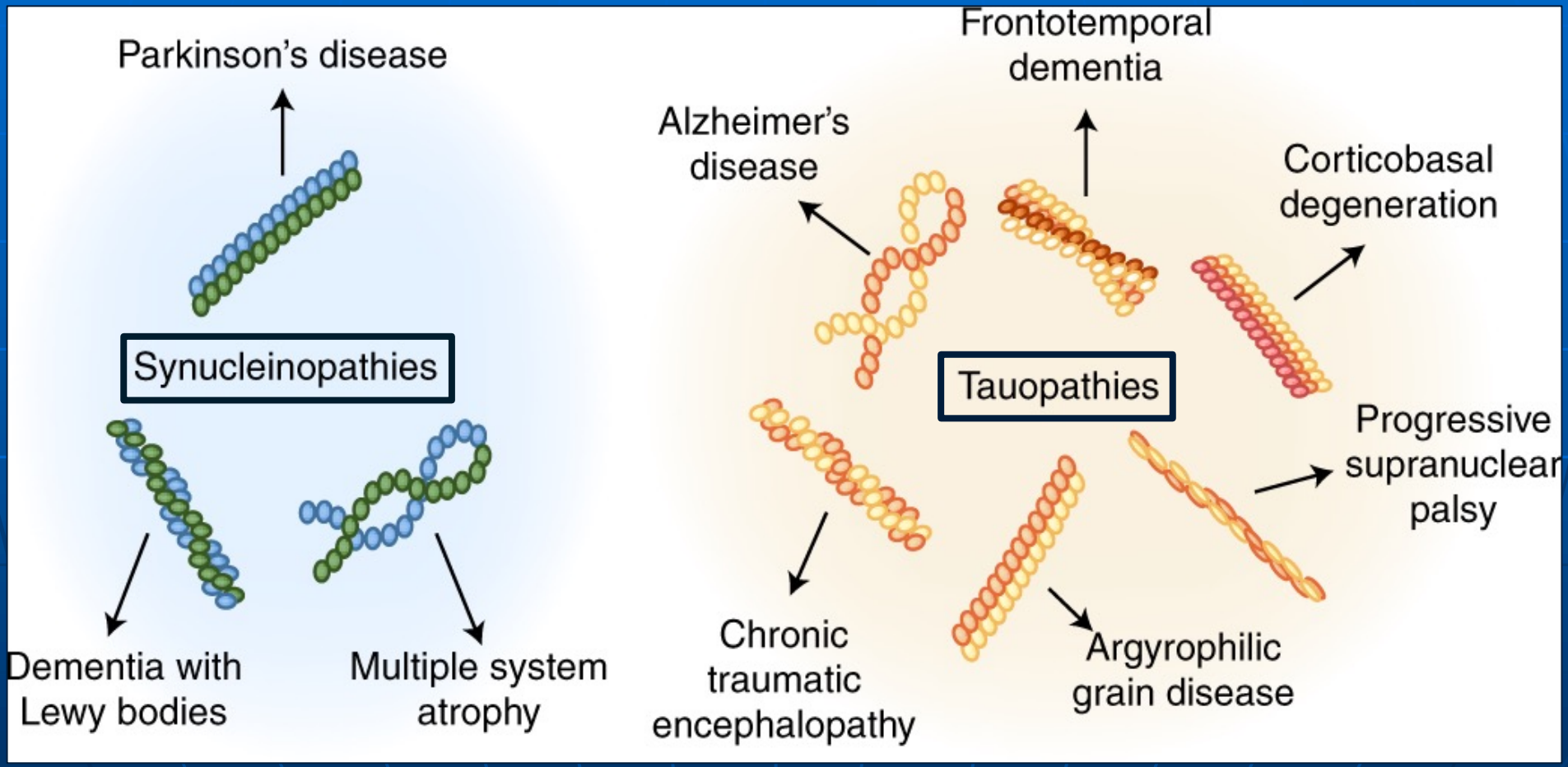
Protein aggregation in Cataracts



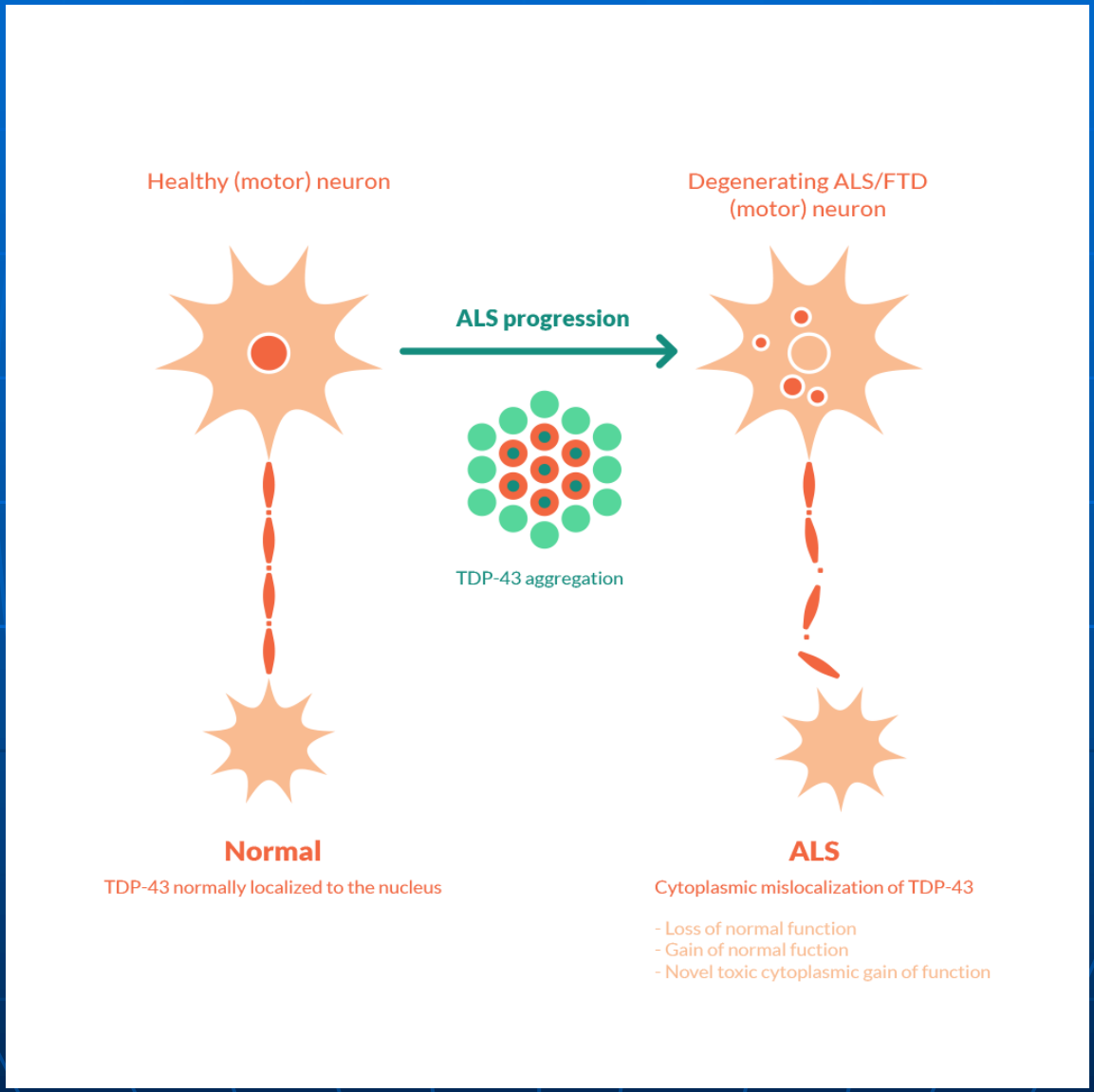
Cataract formation



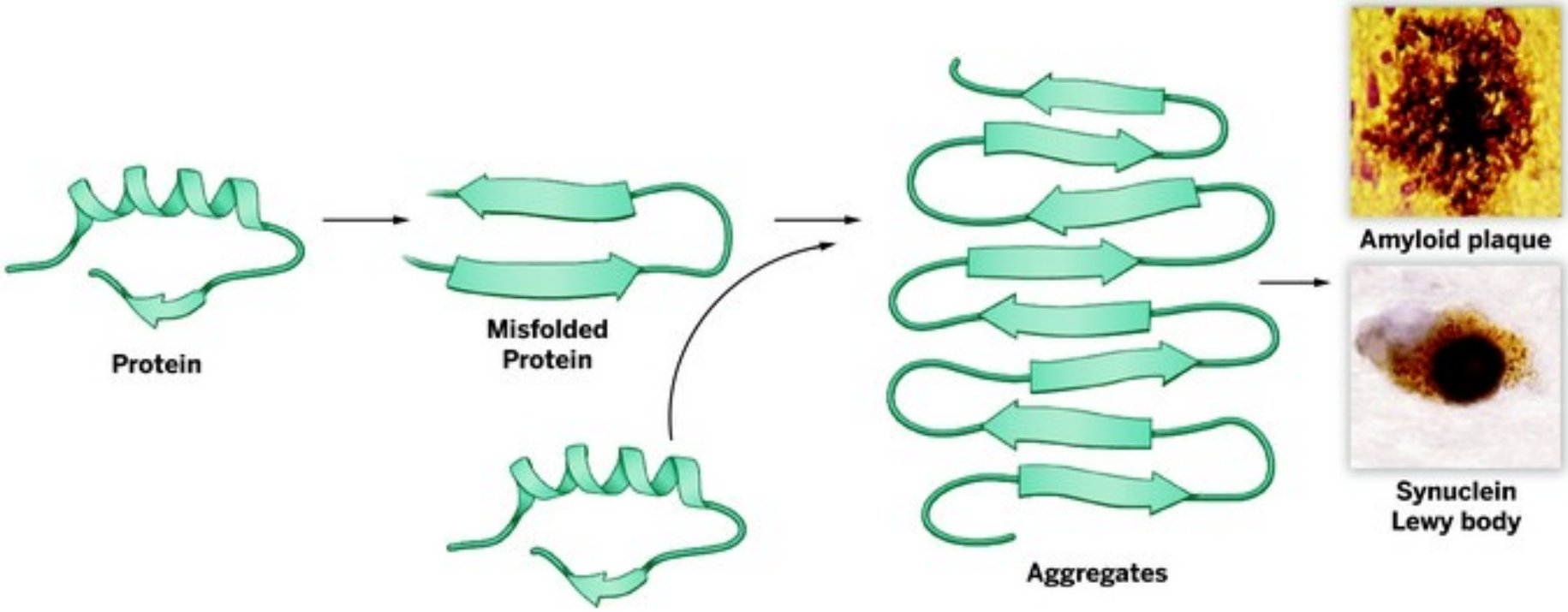

Parkinson's disease
Alzheimer's disease
Huntington's disease
Amyotrophic lateral sclerosis
Frontotemporal dementia
α-syn
Tau
Aβ
m-Htt
TDP-43
Tau
TDP-43
Misfold
Misfold
Misfold
Misfold
Misfold
Aggregation
Aggregation
Aggregation
Aggregation
Aggregation
Cell dysfunction and death
Cell dysfunction and death
Cell dysfunction and death
Cell dysfunction and death
Cell dysfunction and death


Parkinson's disease
Synucleinopathies
Dementia with Lewy bodies
Multiple system atrophy
Frontotemporal dementia
Alzheimer's disease
Corticobasal degeneration
Tauopathies
Progressive supranuclear palsy
Chronic traumatic encephalopathy
Argyrophilic grain disease

Lou Gehrig's TDP-43 plaques



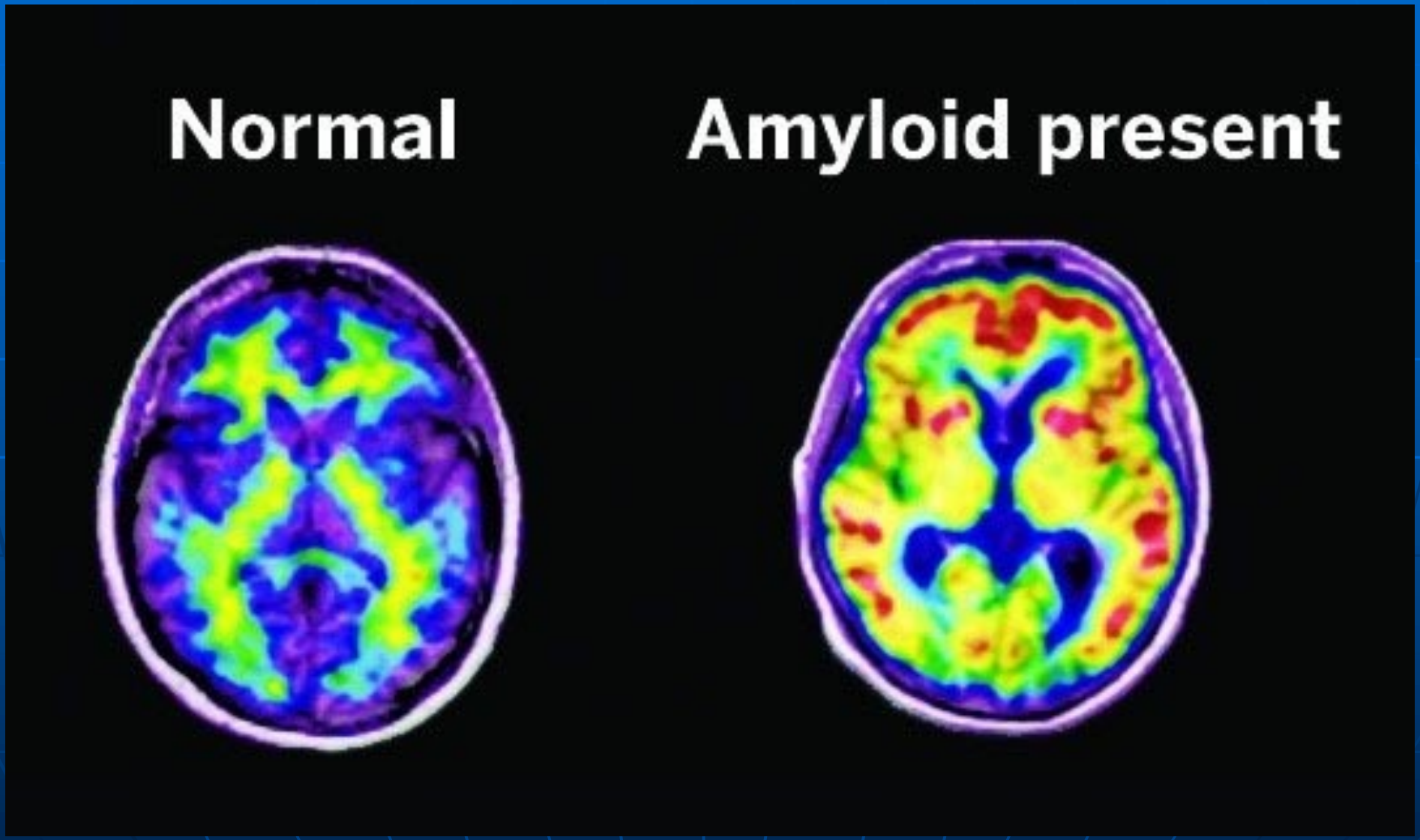
Protein Misfolding



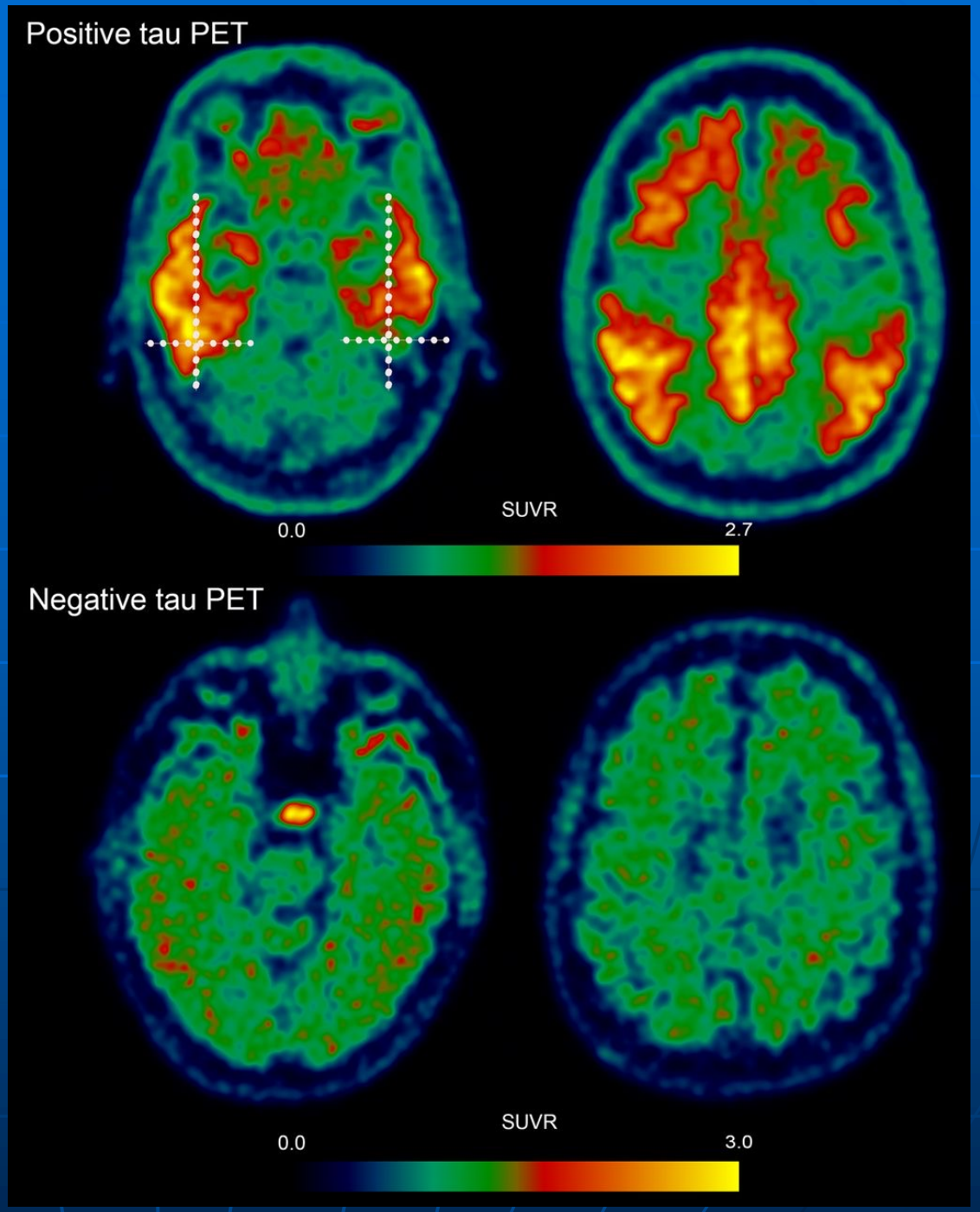
Diagnosis of Alzheimer's Dis

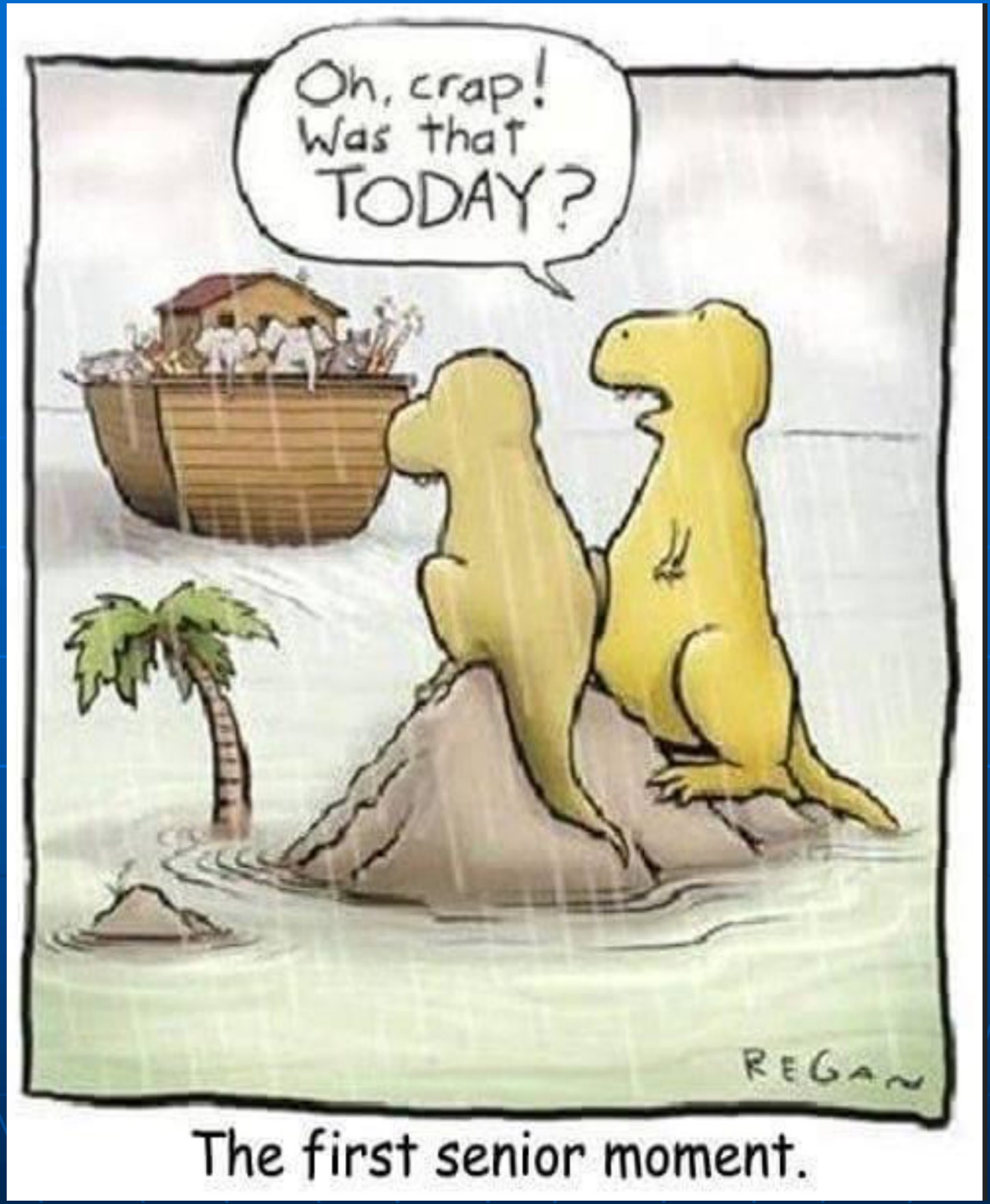
- Symptoms
  - Progressive short term memory loss, Orientation, Language
- Physical Exam, blood/urine, brain MRI
  - Rule out other causes of memory loss
- PET SCANs
  - Amyloid & Tau

Amyloid PET Scan



Tau PET Scan

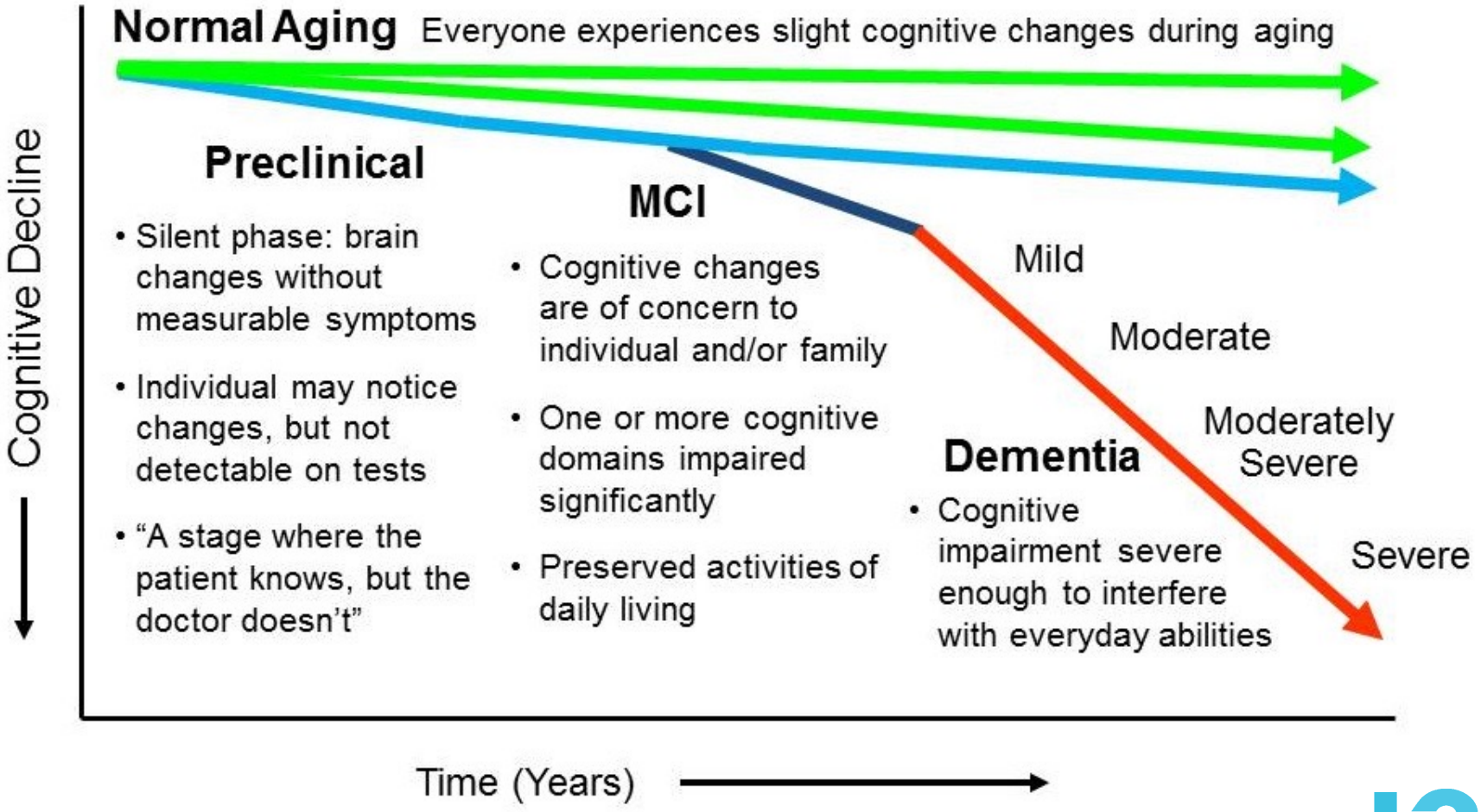



Oh, crap! Was that TODAY?
REGAN
The first senior moment.

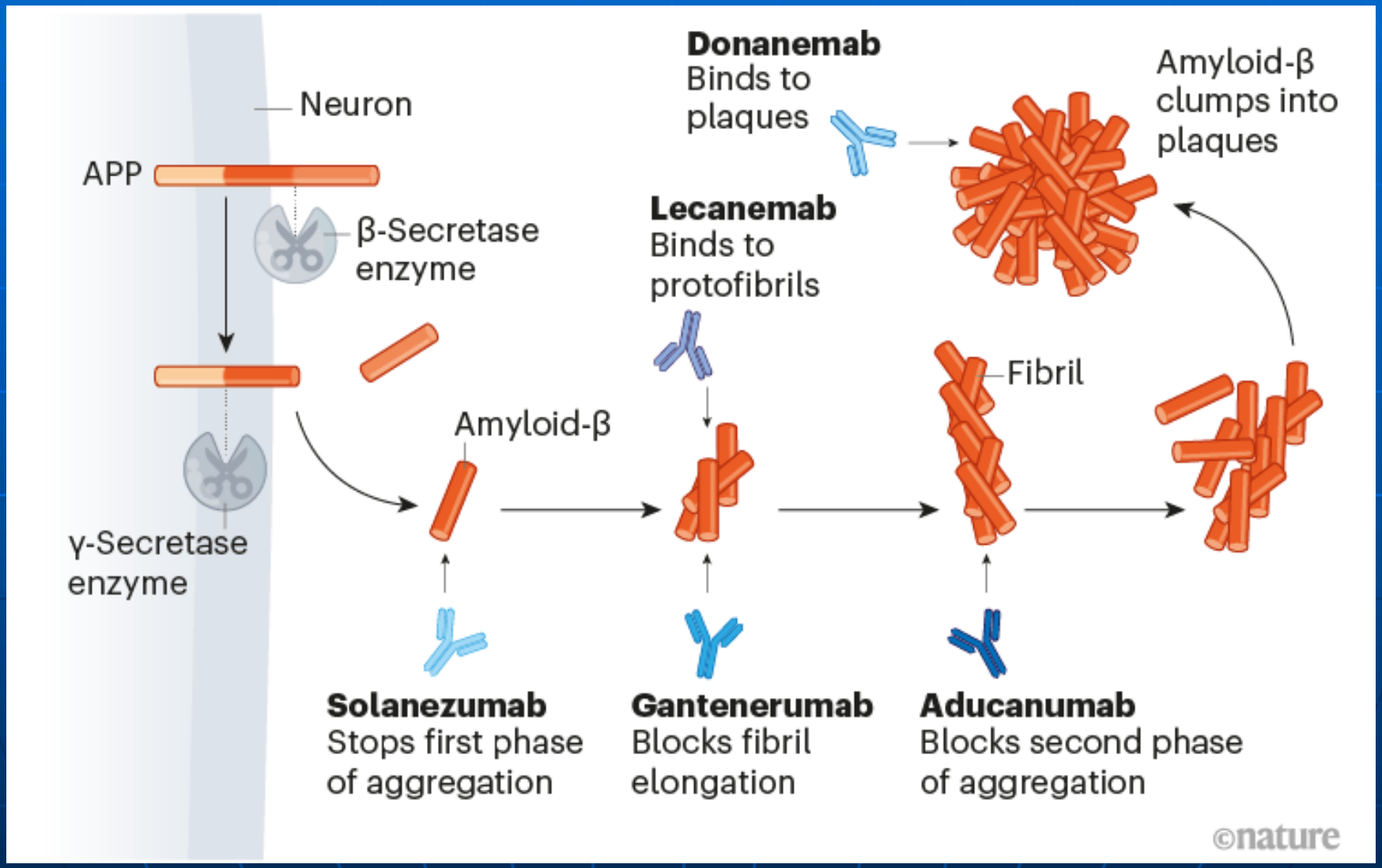
When does Alzheimer's begin?

20 years *before* symptoms

When does Alzheimer's begin?



Antibodies binding Amyloid



IS PREVENTION POSSIBLE?

- Now that we can successfully remove Amyloid in patients with AD, can we remove Amyloid BEFORE symptoms start?

Prevention Trials

2013-2023

2020-2027

AHEAD STUDY

NIH National Institutes of Health

Stanford University

Yale University

Georgetown University

MAYO CLINIC

HARVARD MEDICAL SCHOOL

UNIVERSITY OF MICHIGAN

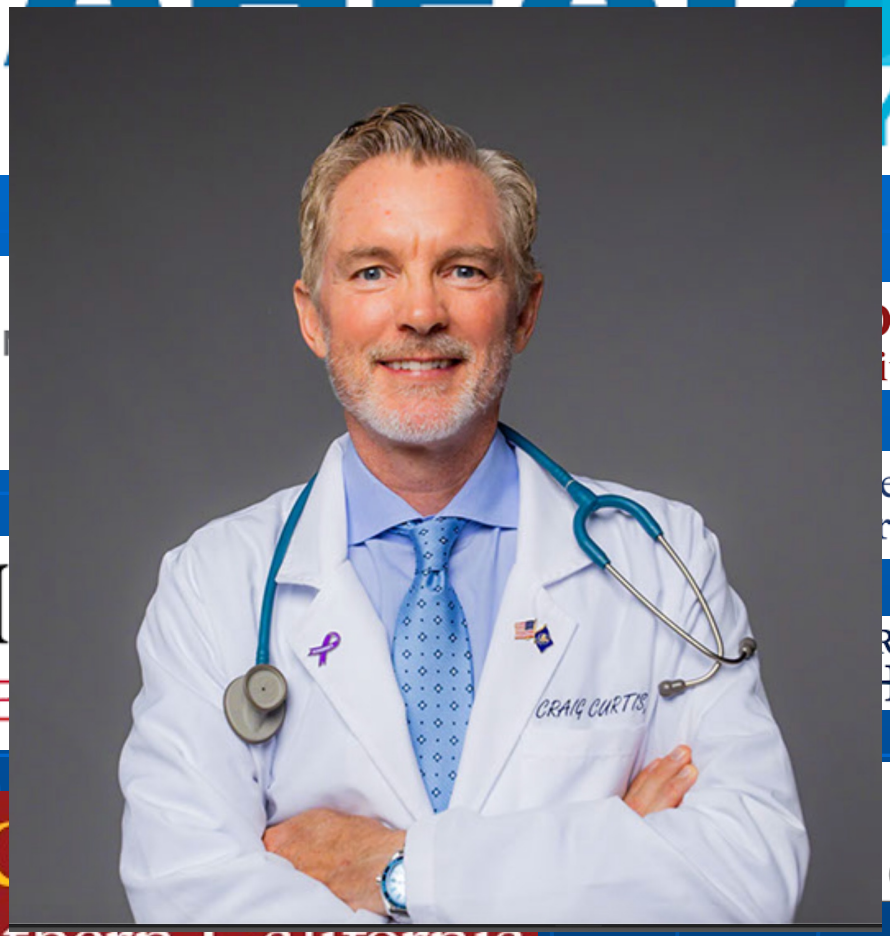
Cleveland Clinic

USC University of Southern California

THE OHIO STATE UNIVERSITY

Mass General Brigham

HERE in
The Villages, FL



NIH

Yale University

MAYO CLINIC

Cleveland Clinic

Ohio State University

Mass General Brigham

HERE in
The Villages, FL

Can you improve your Brain Health?

Brain Health & Prevention

- Exercise
- Sleep
- Nutrition

Exercise

longevity.stanford.edu/lifestyle/2024/05/28/how-exercise-reduces-risk-of-alzheimers-disease/

Stanford | Lifestyle Medicine

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How Exercise Reduces Risk of Alzheimer's Disease

May 28, 2024 / in Cognitive Enhancement, Mental Health, Movement & Exercise /

By Tanya Thakur, MBBS

Alzheimer's disease (AD) is one of the most devastating illnesses among older adults. The disease not only degrades memories but also affects one's independence and takes a toll on family members.

AD is a progressive neurodegenerative disorder caused by the accumulation of abnormal misfolded protein deposits in the brain, including beta-amyloid plaques, tau tangles, and Hirano bodies. These deposits disrupt normal neuronal function, leading to the gradual loss of memory, cognitive skills, and, eventually, the ability to carry out daily activities.

“It’s hard to imagine anything better for brain health than daily exercise..”

Rudolph Tanzi, MD

Joseph P. and Rose F. Kennedy Professor of Neurology at Harvard Medical School

Exercise

- Alzheimer Society meta-analysis 16 studies **28%** reduction Alzheimer's risk
- Study 78,000 in UK found **25%** reduction in Dementia with only 3,800 steps per day

Exercise – more evidence

- Journal of American Geriatric Society
  - 19 studies 1100 subjects avg age 77
  - Mild cognitive impairment or mild AD
  - Exercise group vs non exercise groups
  - Avg 3 days/week 30-45min moderate exercise over 18 weeks
  - Results:
    - **Improved cognition in exercise group**
    - Cognitive function declined in non-exercise

Exercise – more evidence

- Journal of Alz Disease Jan 2024
  - International study MRI 10,125 subjects ages 18-97
  - Those who engage in moderate to vigorous exercise>25 minutes/week MAINTAIN BRAIN SIZE with larger brain volume Gray/White matter
  - Most pronounced in hippocampal area
  - Suggests neuroprotective **benefits in as little as 10 min 3 days per week**

Exercise

- Multiple studies have found that regular exercise increases brain volume

Exercise

- Aerobic Exercise
  - increases genes that promote synaptic connections and BDNF
    - BDNF = neurogenesis, neuroprotection, brain angiogenesis, increases Hippocampal volume and overall brain volume

Exercise

- Resistance Training
  - believed to increase insulin-like growth factor-1 (IGF-1)
    - IGF-1 manages the effects of growth hormone promoting cognitive abilities

Mass Inst Tech (MIT)

- Paper released 5 days ago!
- During exercise, muscle cells release hormones that "boost neuron growth and maturity."
- "Exerkines" affect muscle, bone, fat immune cells, nervous system

What is “Moderate” Exercise?

- raises your HR and breathing *slightly*
- “brisk”
- hold conversation while still feeling slightly challenged
- Target HR 60-75% of max
  - 220-age = max then multiply (60-75%)
  - Example 70 & 80 yo
    - 220-70 = 150 then x 60-75% = **90-113**
    - 220-80 = 140 then x 60-75% = **84-105**

How much do you need?

- CDC recommends 150 min week moderate or 75 min week vigorous
- Most Experts Agree (and so do I):

20-30 minutes 3-4/week

"It's hard to imagine anything better for brain health than daily exercise.."

Rudolph Tanzi, MD

Joseph P. and Rose F. Kennedy Professor of Neurology at Harvard Medical School

Exercise

- **Exercise training increases size of hippocampus and improves memory. Proceeds National Academy of Sciences 2011 – older adults, 40 min moderate walking (target HR 60-70% max) 3x week**
  https://pmc.ncbi.nlm.nih.gov/articles/PMC3041121/