

Current Ideas About the Causes and Cures for Alzheimer's Disease

Steve Barger, PhD



**Donald W. Reynolds Department of Geriatrics
University of Arkansas for Medical Sciences**

Alzheimer's disease prevalence: A common problem that's only getting worse

An estimated 5.3 million Americans of all ages had Alzheimer's disease as of 2015.

Almost 2/3 of Americans with Alzheimer's are women.

Of the 5.3 million Americans with Alzheimer's, an estimated 5.1 million people are age 65+ (~12.6%), and approximately 200,000 individuals are under age 65 (early-onset Alzheimer's).

By 2025, the number of people aged 65+ with Alzheimer's disease is estimated to reach 7.1 million — a 40% increase

By 2050, the number of people aged 65+ with Alzheimer's disease may nearly triple, to 13.8 million.

Alzheimer's disease mortality: *A common problem that's only getting worse*

Alzheimer's is the only disease among the top 10 causes of death in America that cannot be prevented, cured, or even slowed.

In 2015, an estimated 700,000 Americans aged 65+ (roughly 1/3) died with Alzheimer's.

From 2000 to 2013, U.S. deaths attributed to Alzheimer's disease increased 71%.

In **Arkansas**, Alzheimer deaths increased more than 100% during that time. (Meanwhile, deaths attributed to heart disease decreased by 14%).

Alzheimer's disease economics: *An investment we can't afford to pass up*

The cost of U.S. Alzheimer's disease care was estimated at \$226 billion in 2015.

Nearly 1 in every 5 Medicare dollars is spent on people with Alzheimer's and other dementias. In 2050, it will be 1 in every 3 dollars.

A treatment that delays the onset of Alzheimer's by 5 years would save all payers (Medicare, Medicaid, and families) more than **\$220 billion** *within the first five years!*

Without new treatments, the funds devoted to Alzheimer's in Arkansas are expected to rise 44% by 2025.

Alzheimer's disease impact on the caregivers: hidden costs

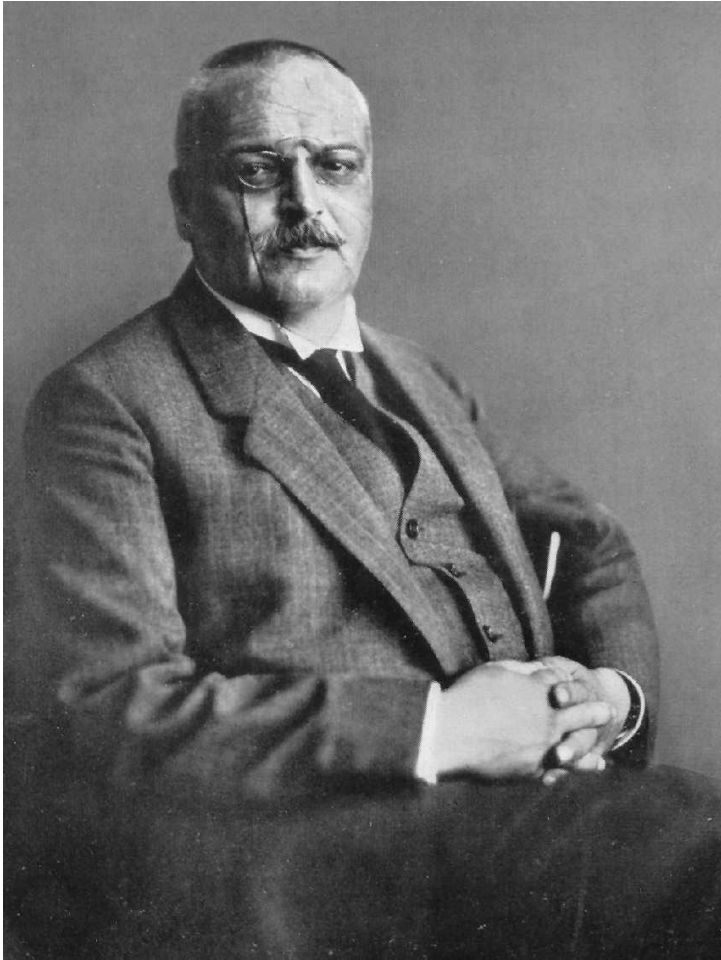
In 2014, friends and family of people with Alzheimer's and other dementias provided an estimated 18 billion hours of unpaid care, valued at \$218 billion. (This is approximately 46% of the net value of Walmart sales in 2013 and nearly eight times the total revenue of McDonald's in 2013.)

Approximately two-thirds of caregivers are women and 34% are age 65+ — 41% of caregivers have a household income of \$50,000 or less.

A devastating toll: Nearly 60 percent of Alzheimer's and dementia caregivers rate the emotional stress of caregiving as high or very high; about 40% suffer from depression.

Due to the physical and emotional toll of caregiving, Alzheimer's and dementia caregivers had \$9.7 billion in additional health care costs of their own in 2014.

Alzheimer's history

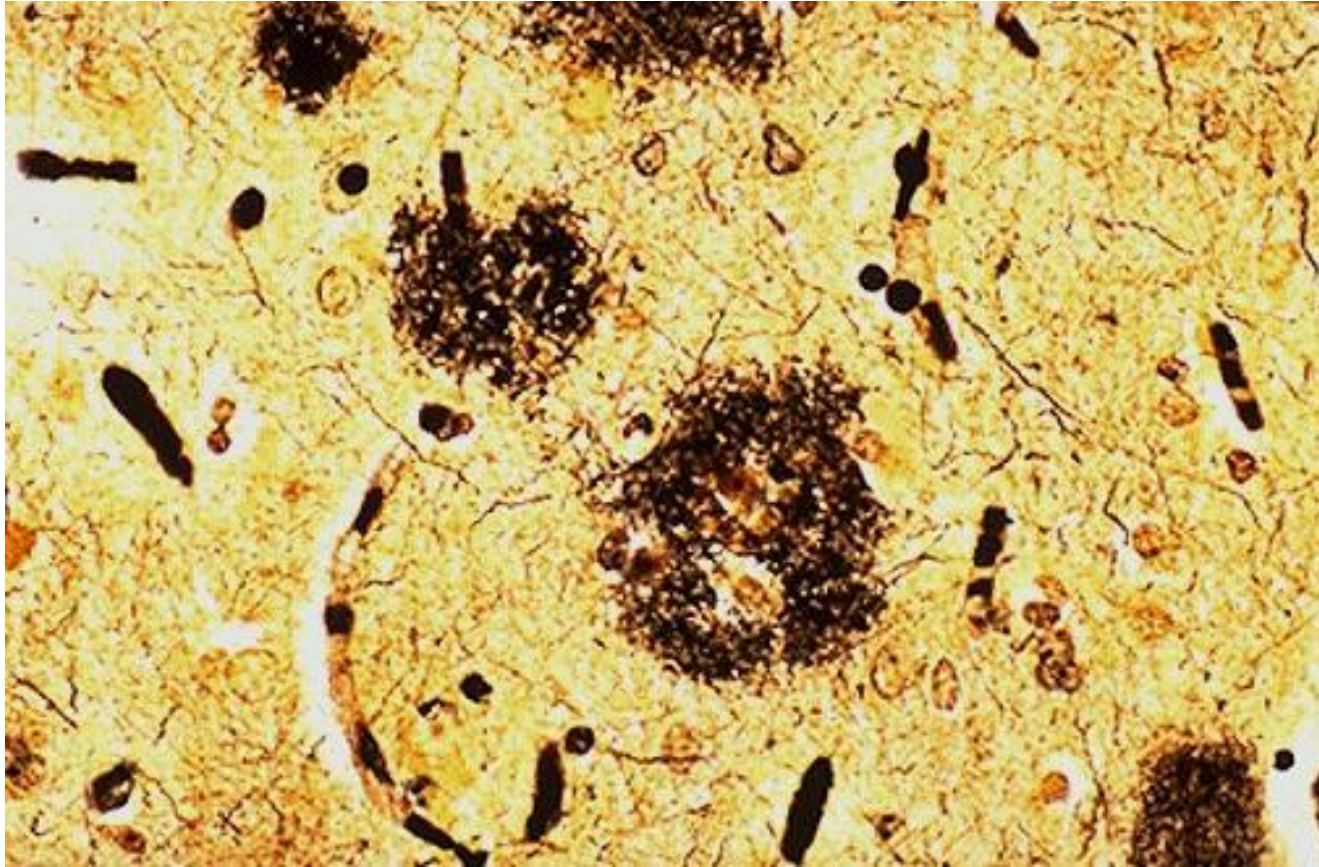


Alois Alzheimer:
“the psychiatrist with the microscope”



Auguste Deter,
interviewed in 1901

Micropathology of Alzheimer's



Alzheimer Brain: Gross Anatomy

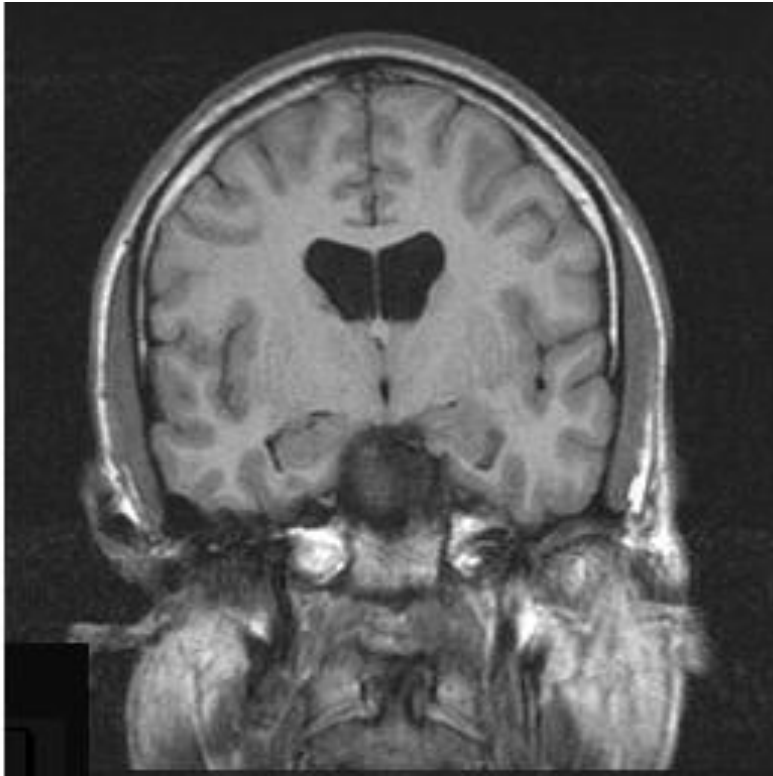


Normal

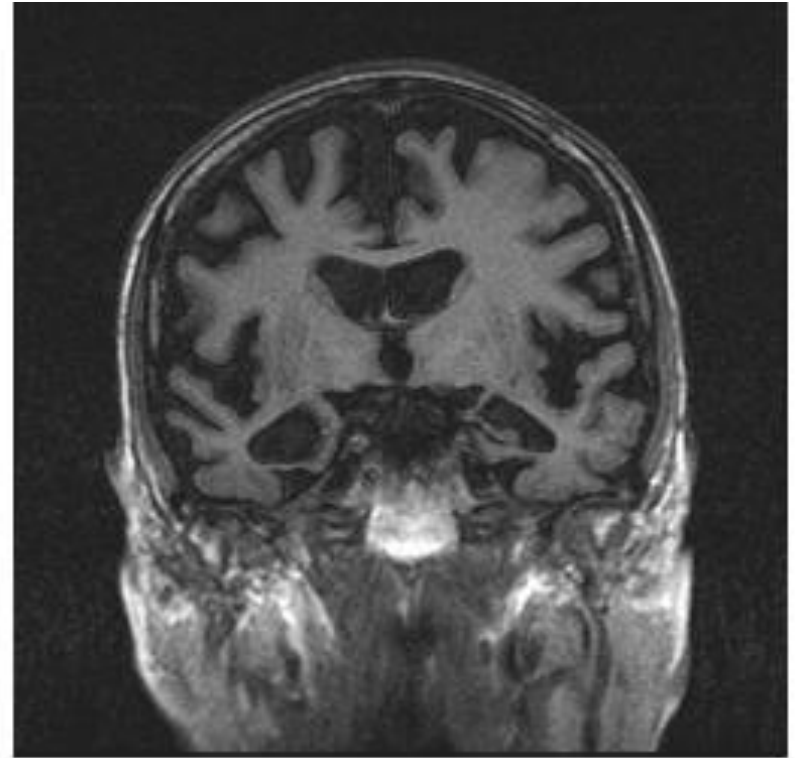


Alzheimer

Alzheimer Brain: MRI



Normal

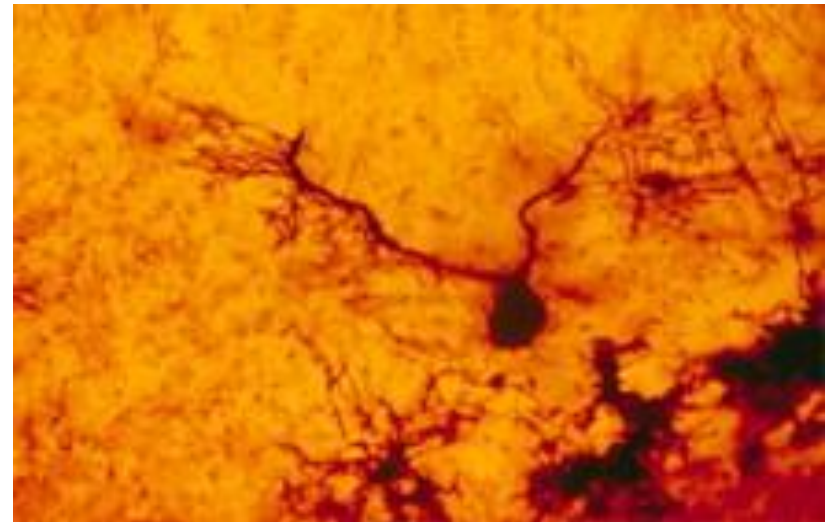


Alzheimer

Nerve cell pruning in Alzheimer's disease

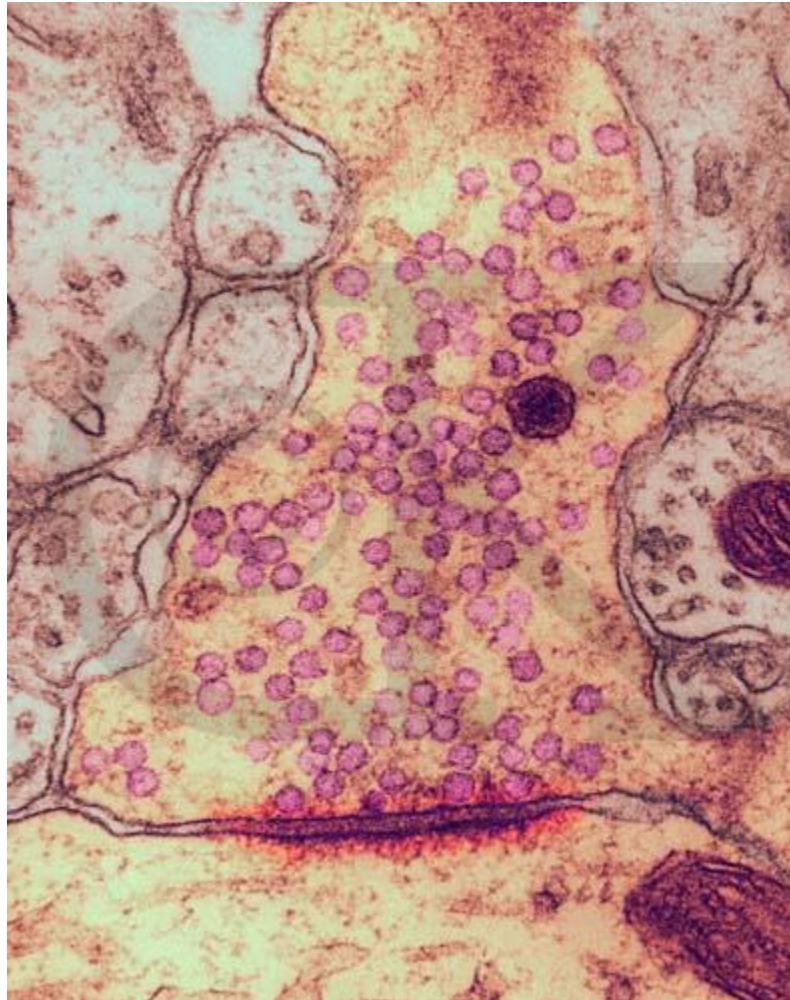


Normal



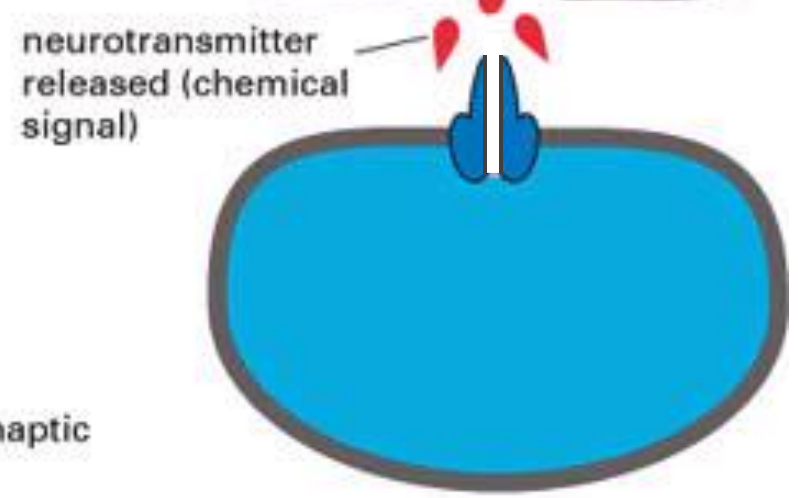
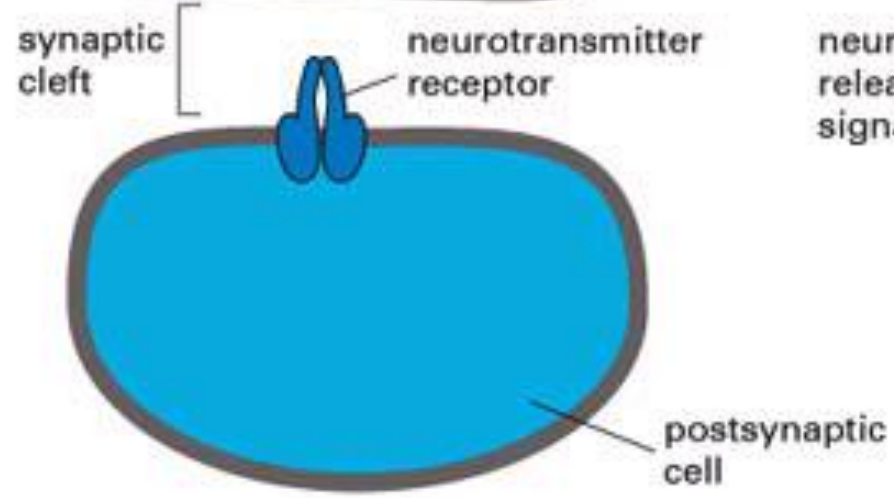
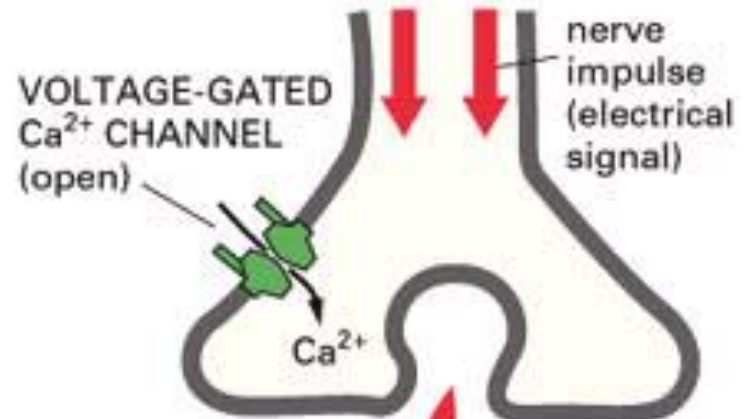
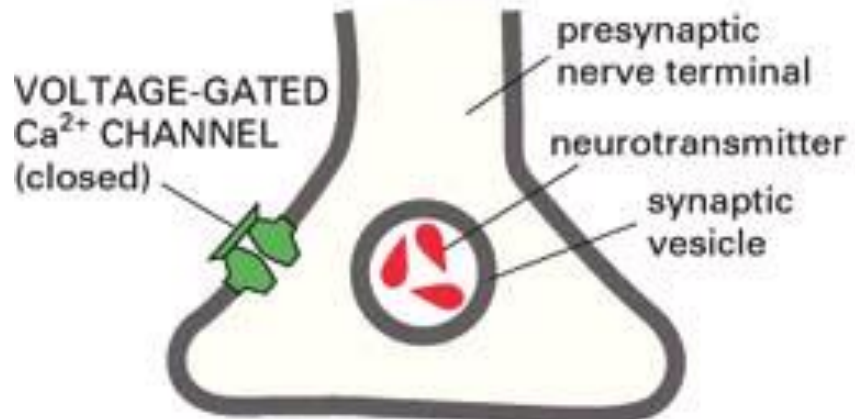
Alzheimer

The synapse: Relay node between nerve cells



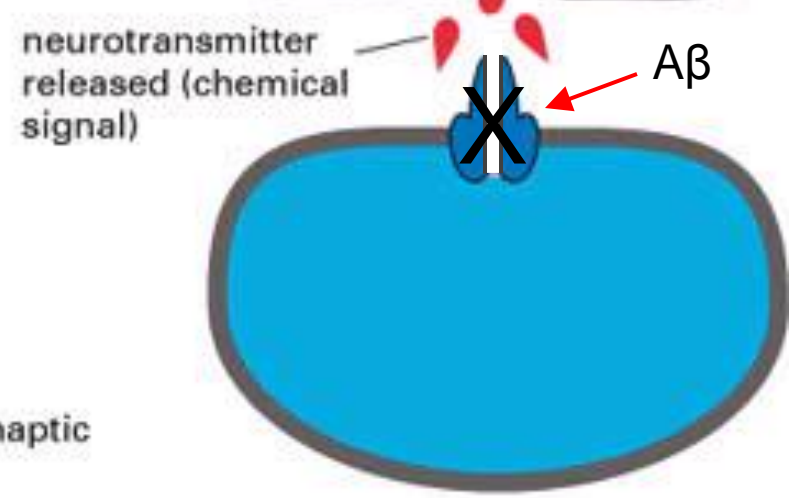
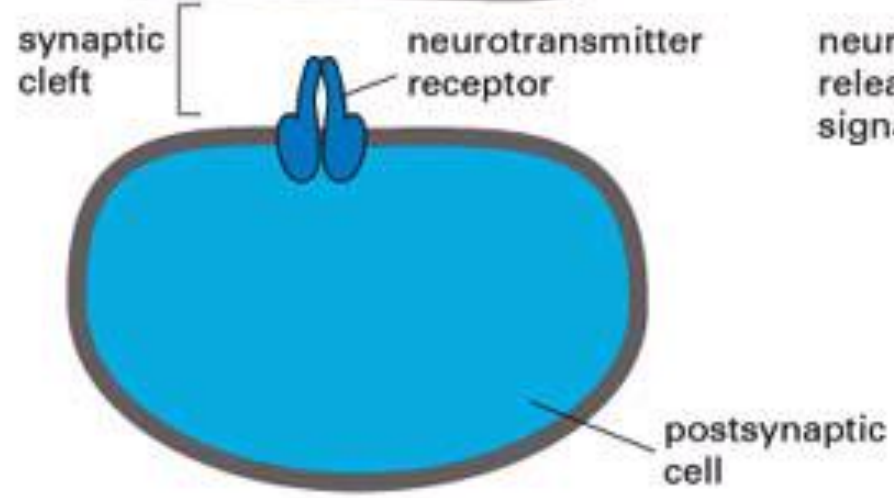
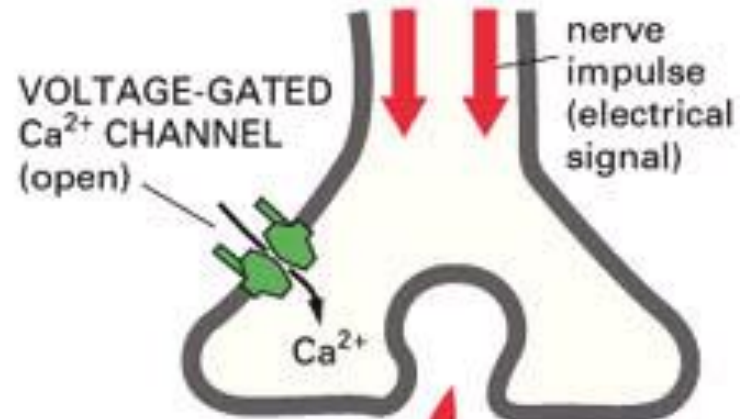
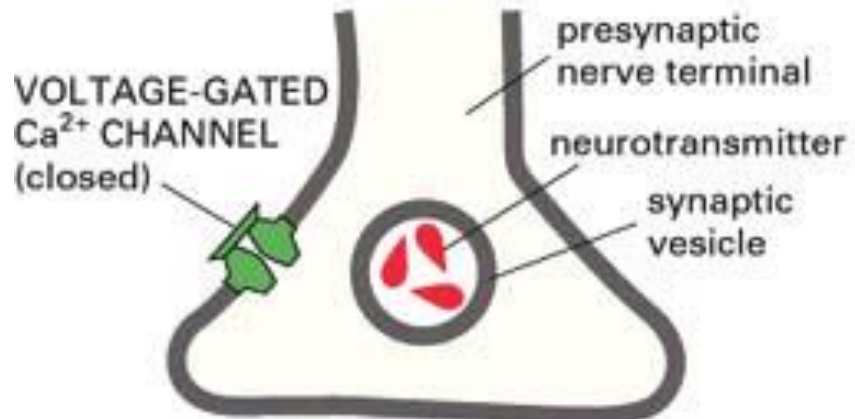
RESTING NERVE TERMINAL

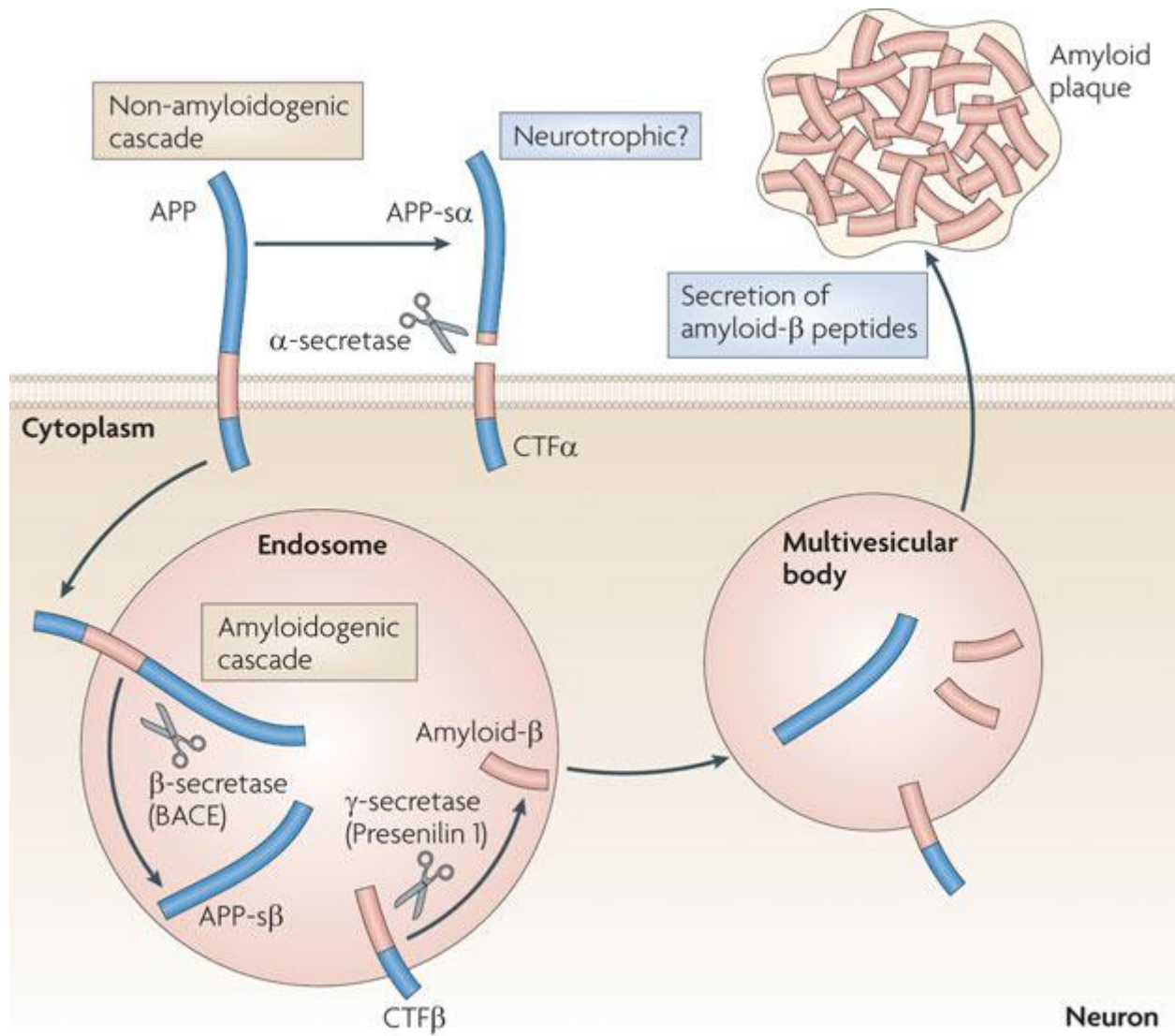
ACTIVATED NERVE TERMINAL

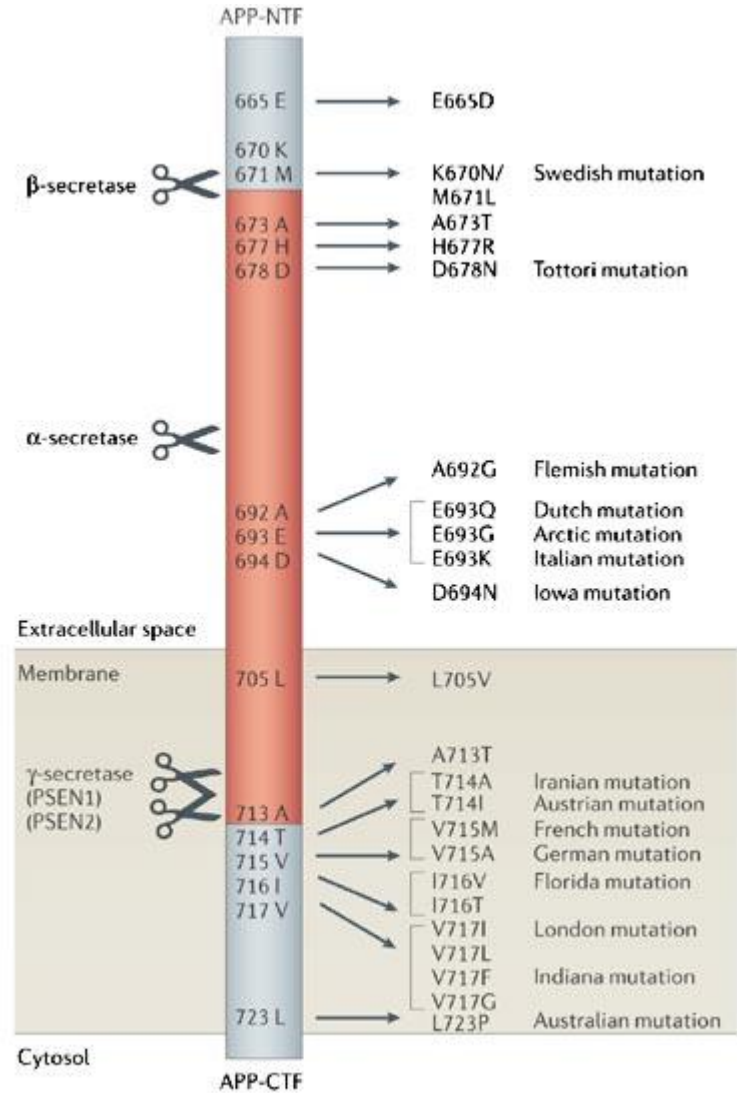
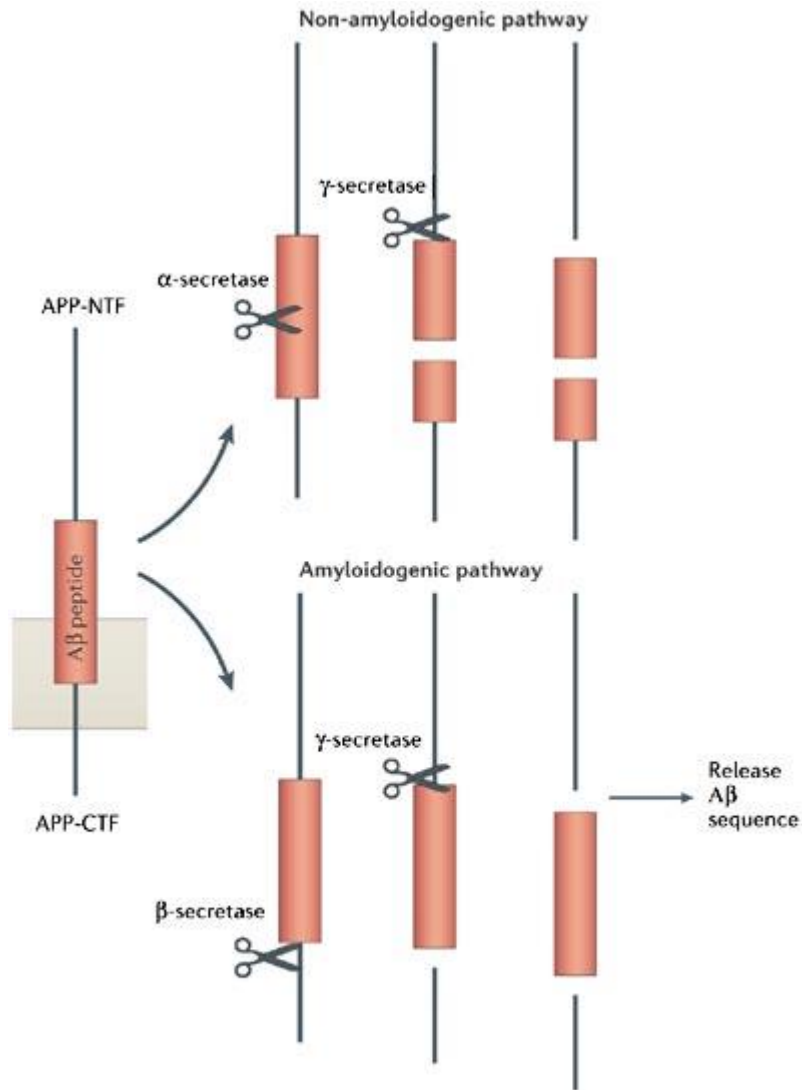


RESTING NERVE TERMINAL

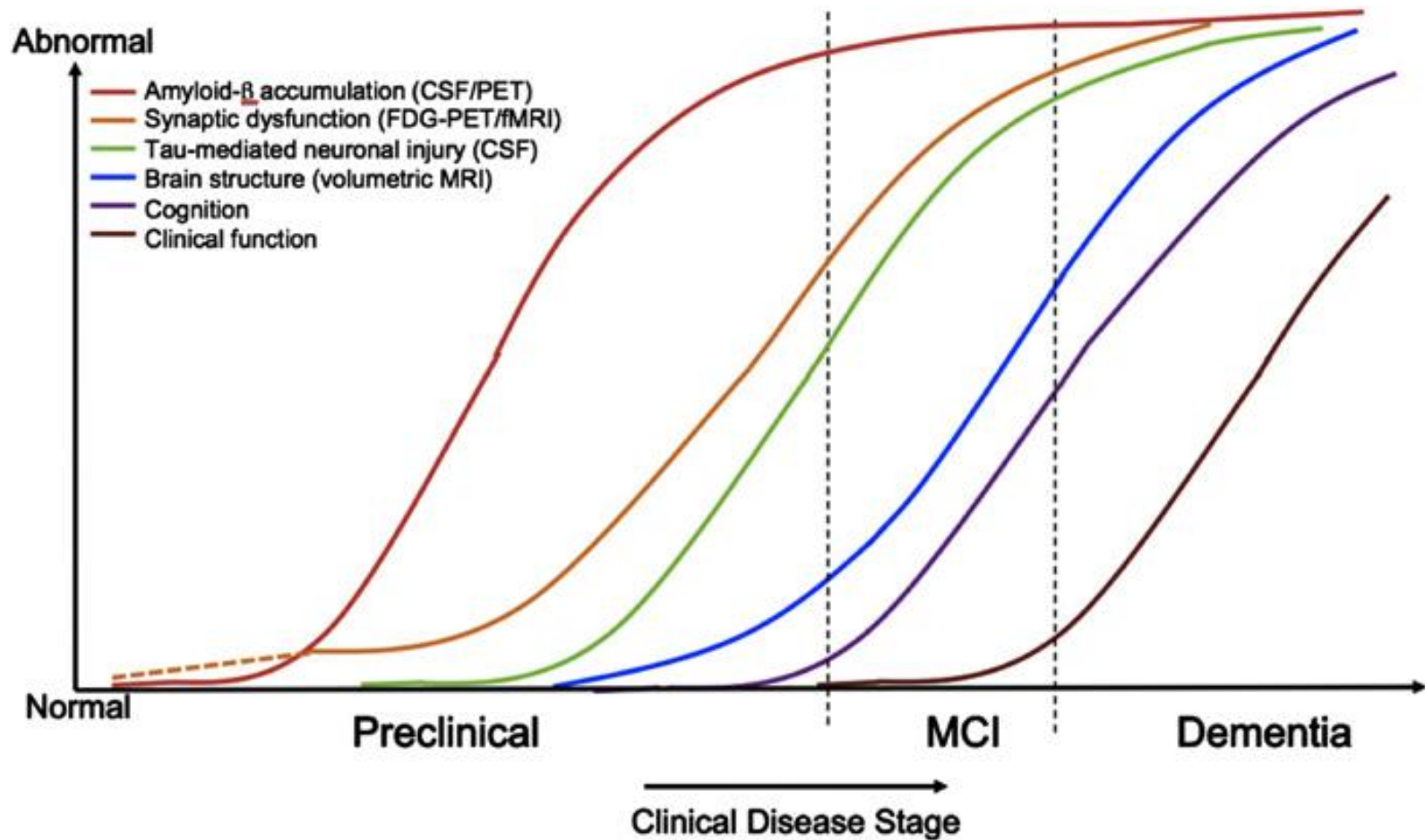
ACTIVATED NERVE TERMINAL



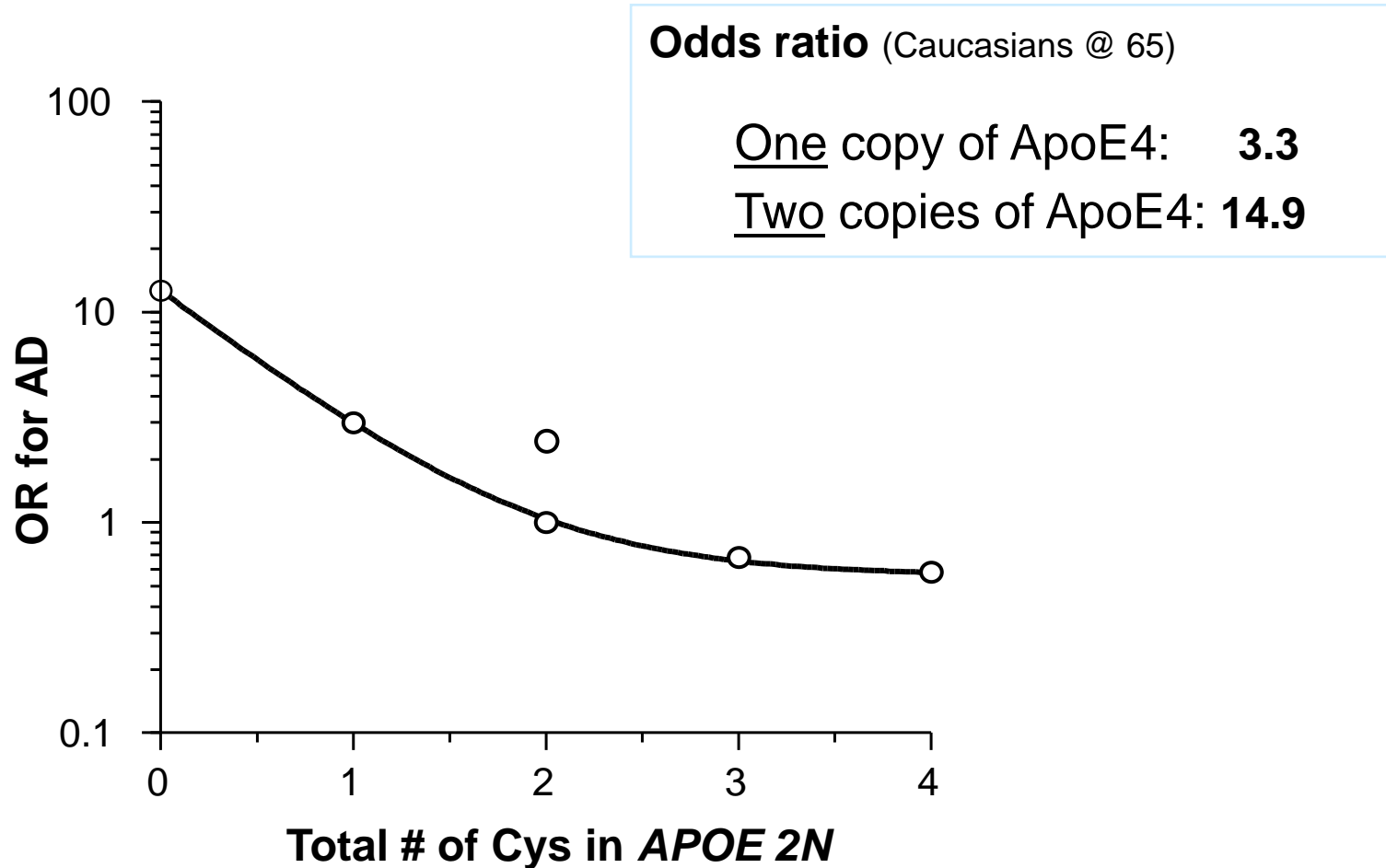




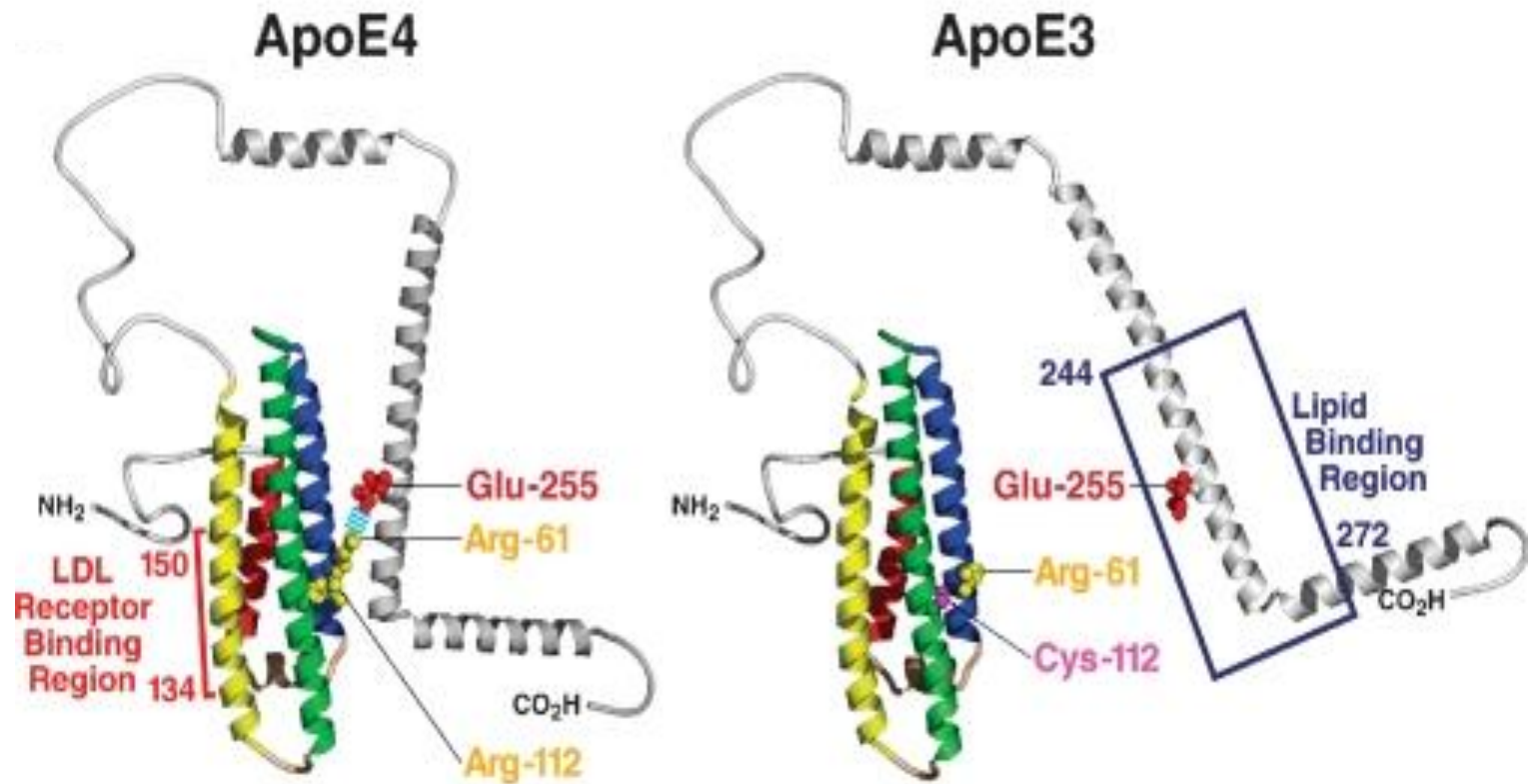
Tracking of “biomarkers” is helping establish the timeline of events in development of Alzheimer’s disease

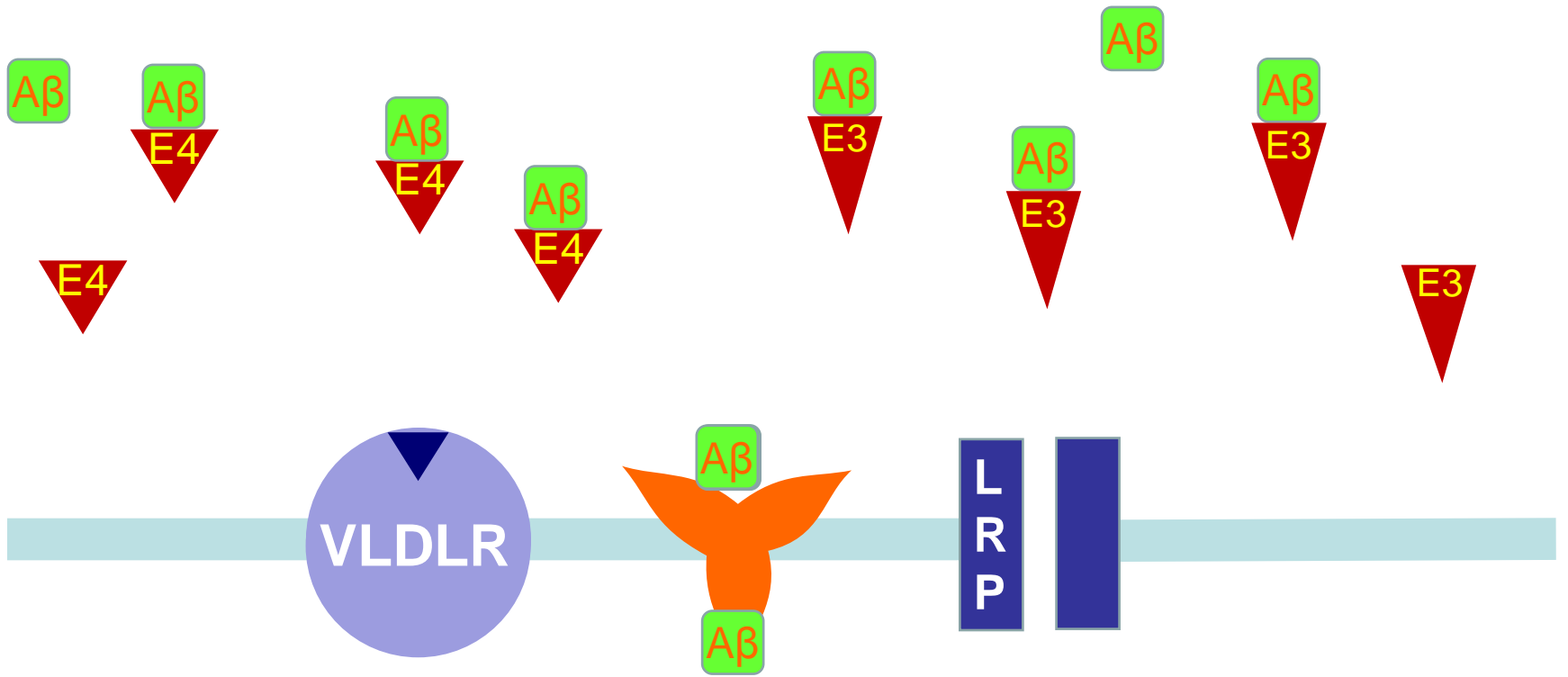


Effects of ApoE Genotype on Risk of AD

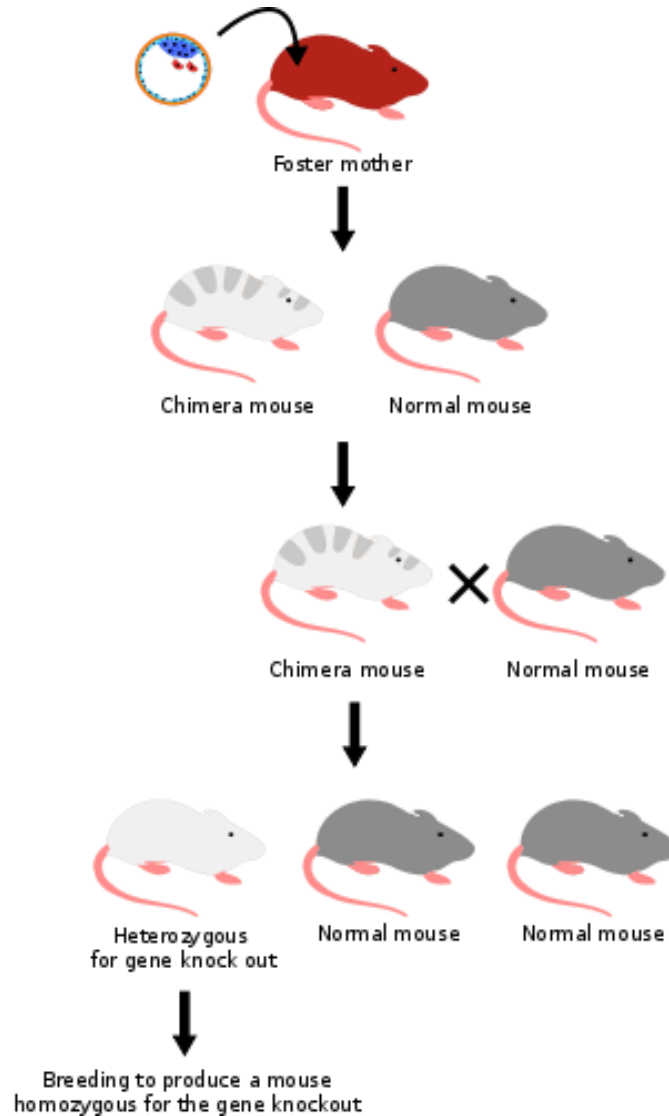


Effects of ApoE Gene Difference: Protein Shape

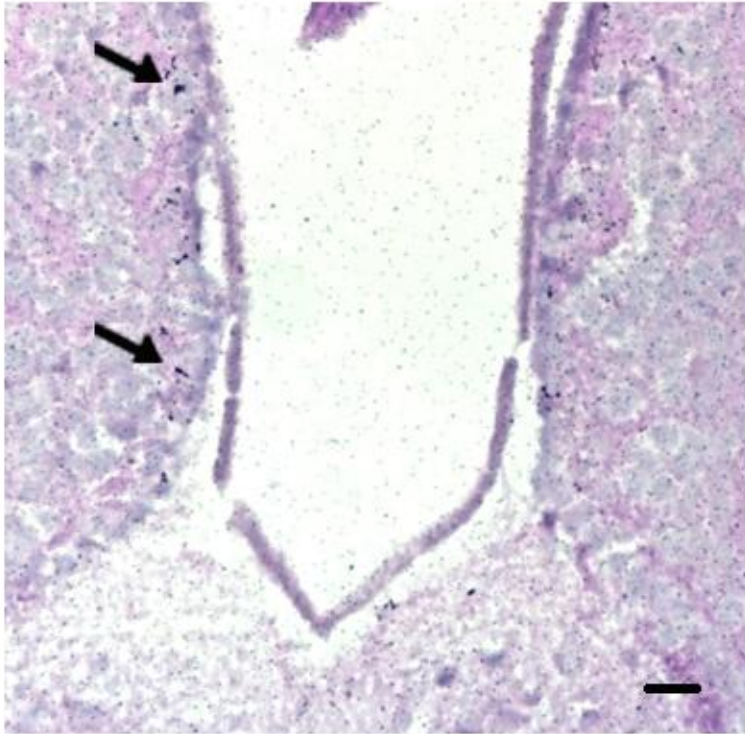




Making a “Knockout” Mouse



Brain Accumulation of A β in p-Glycoprotein-Knockout Mice

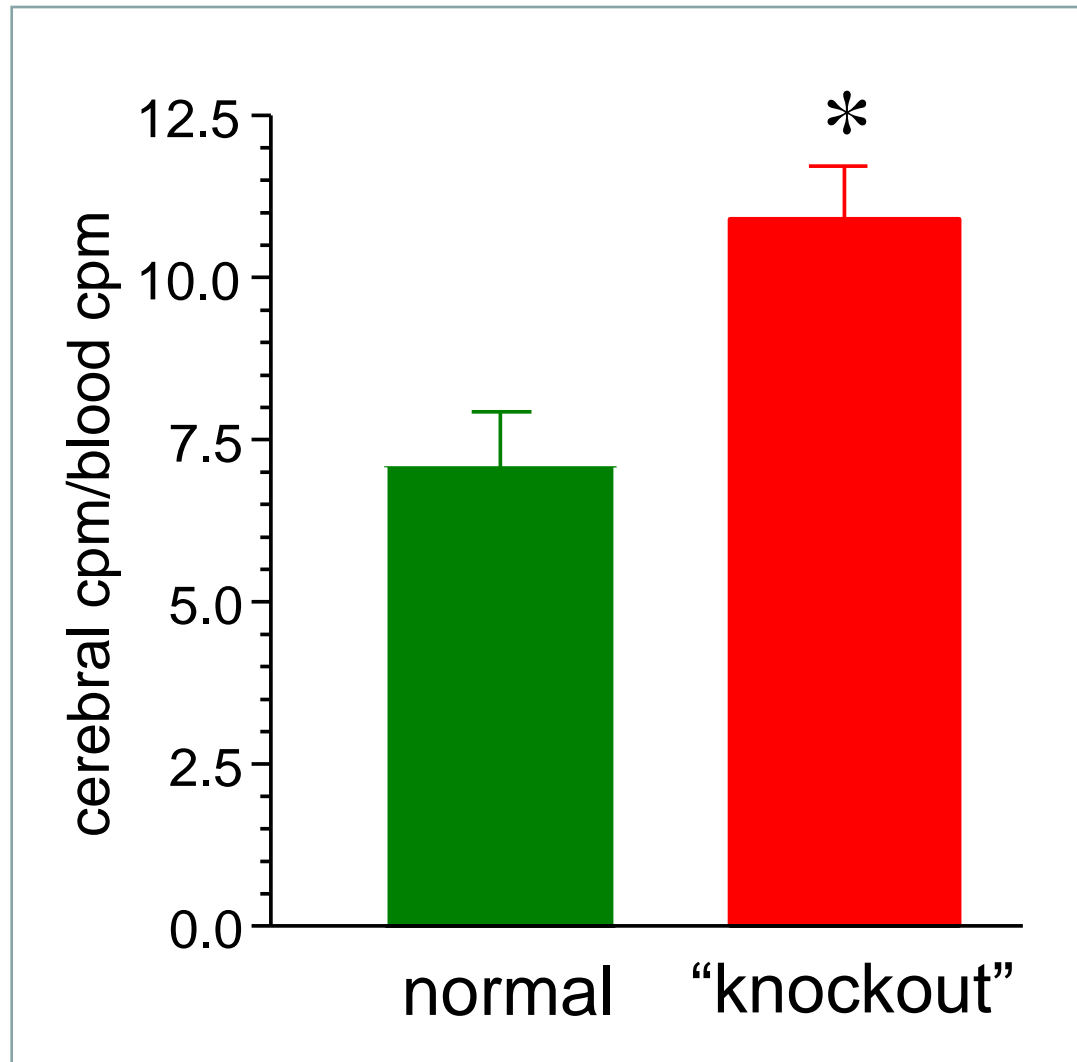


normal

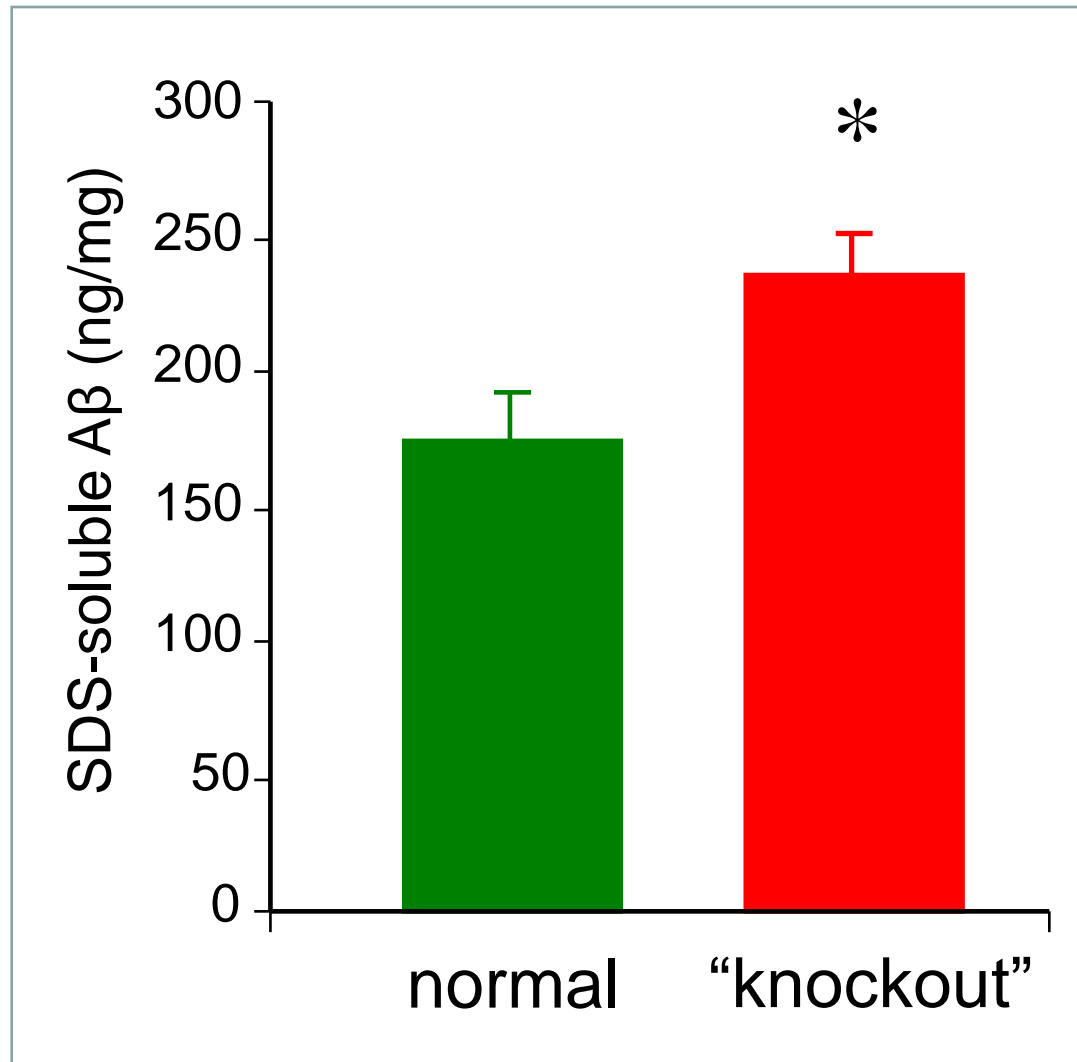


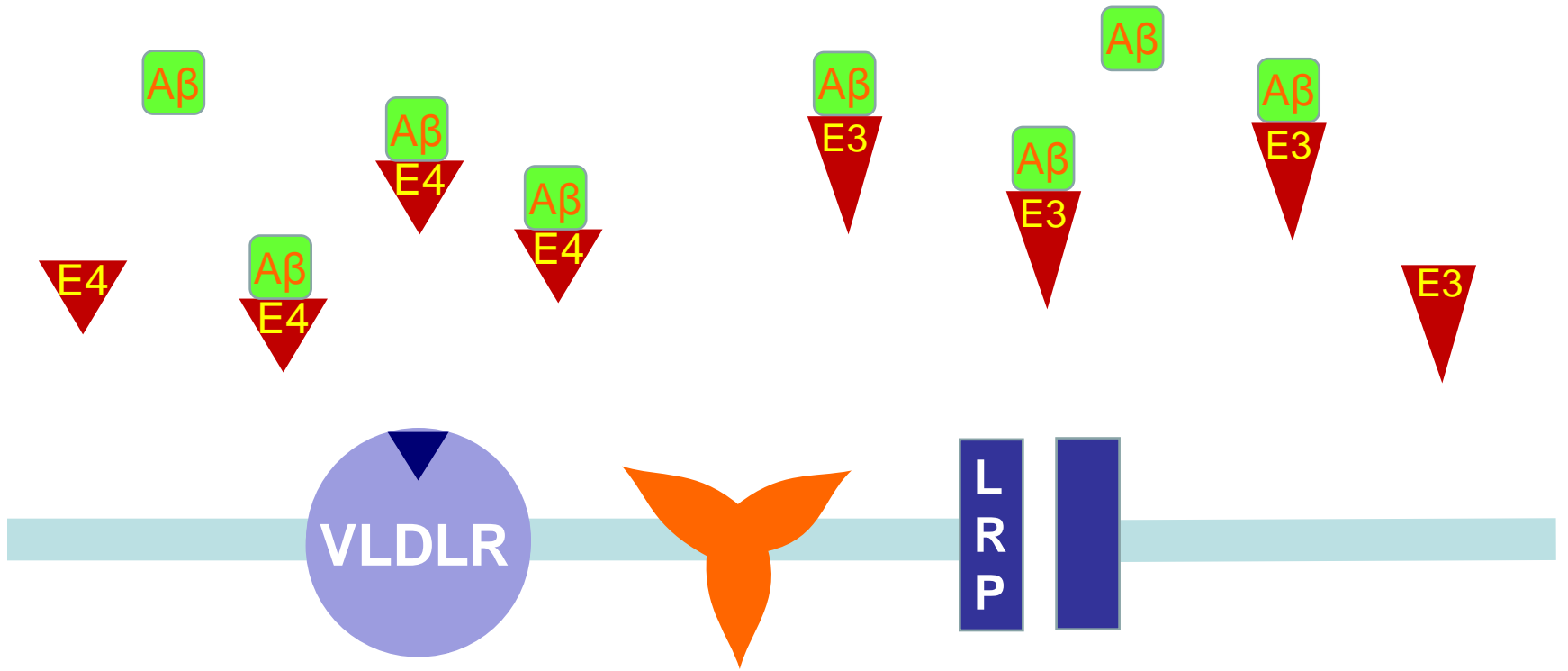
**p-glycoprotein
“knockout”**

Brain Accumulation of A β injected into p-Glycoprotein-Knockout Mice



Brain Accumulation of A β produced in p-Glycoprotein-Knockout Mice





Substrates/Modulators p-Glycoprotein Function

Daunorubicin
Docetaxel
Doxorubicin
Etoposide
Irinotecan
Methotrexate
MitomycinC
Paclitaxel
Vinblastin
Vincristine
Amiodarone
Atorvastatin
Diltiazem
Digoxin
Felodipine
Lovastatin
Nadolol
Pravastatin
Propranolol
Sprinolactone
Talinolol
Timolol
Quinidine

Verapamil
Clarithromycin
Erythromycin
Fluoroquinolones
(Levofloxacin, Grepafloxacin)
Itraconazole
Quinine
Rifampin
Indinavir
Nelfinavir
Ritonavir
Saquinavir
cyclosporine
tacrolimus
cimetidine
fexofenadine
lidocaine
loperamide
morphine
Dexamethasone
Phenobarbital

Rifabutin
St. John's wort
Nifedipine
Propafenone
Ivermectin
ketoconazole
Mefloquine
Ofloxacin
Progesterone

Heard to be the super-sized feminine form...

Losing sense of smell could be linked to poor hea...

Intuition will fire on microsecond times of ...

SUBSCRIBE

SEARCH

LOG IN

Advertisement



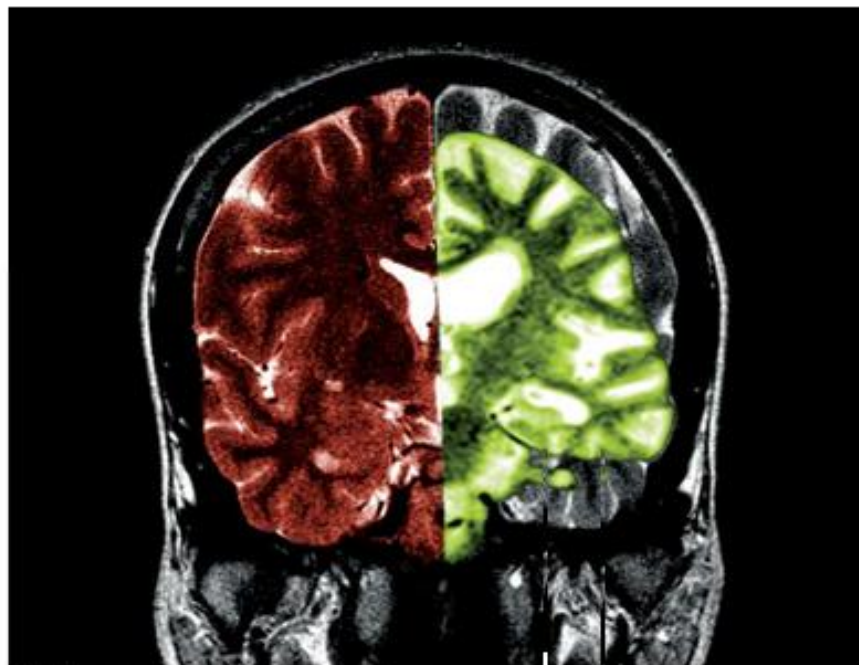
Home | News | Health | Issues



SPECIAL REPORT 27 November 2013

Are Alzheimer's and diabetes the same disease?

The link between obesity and dementia is becoming hard to deny



Are brain changes associated with Alzheimer's (green) reversible?

Image: Medical Body Scan/Jessica Wilson/Photo Researchers/SPU

Advertisement

DIABETIC?
WHAT NOT
TO EAT

WE.bloodygoodinc...

New Video
Explains The 3
Triggers That
Create Type 2
Diabetes.

Connections between diabetes and Alzheimer's disease:

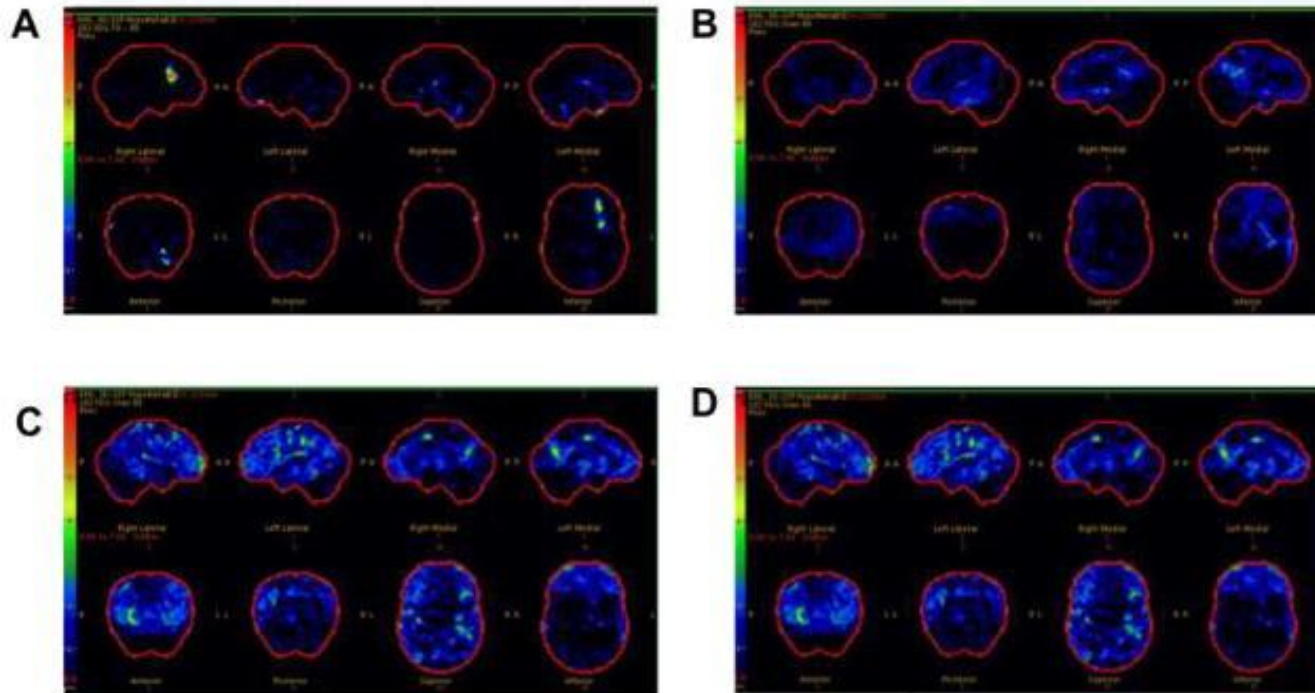
81% of Alzheimer's patients exhibit either Type-2 diabetes or impaired fasting glucose vs. 42% of controls (Janson *et al*)

MMSE decreases 1.37 points per unit increase in HbA1c (effect remains after excluding diabetics)

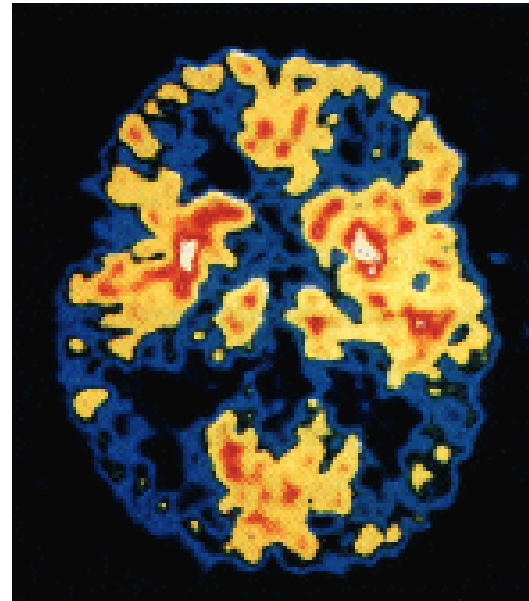
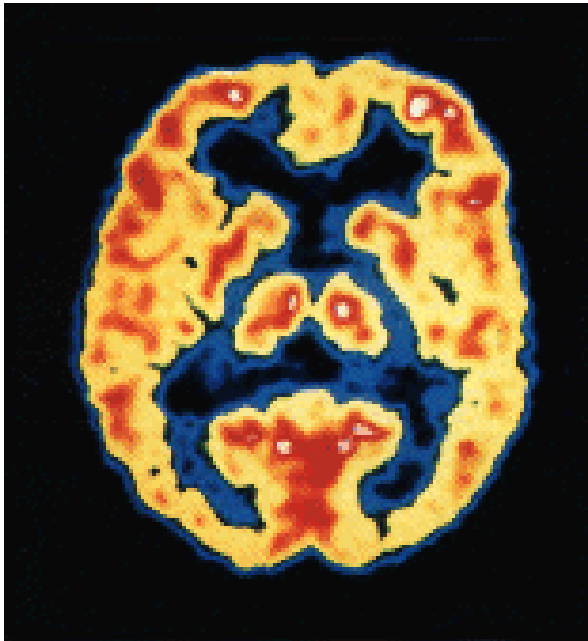
Alzheimer's brain tissue shows diminished insulin responses

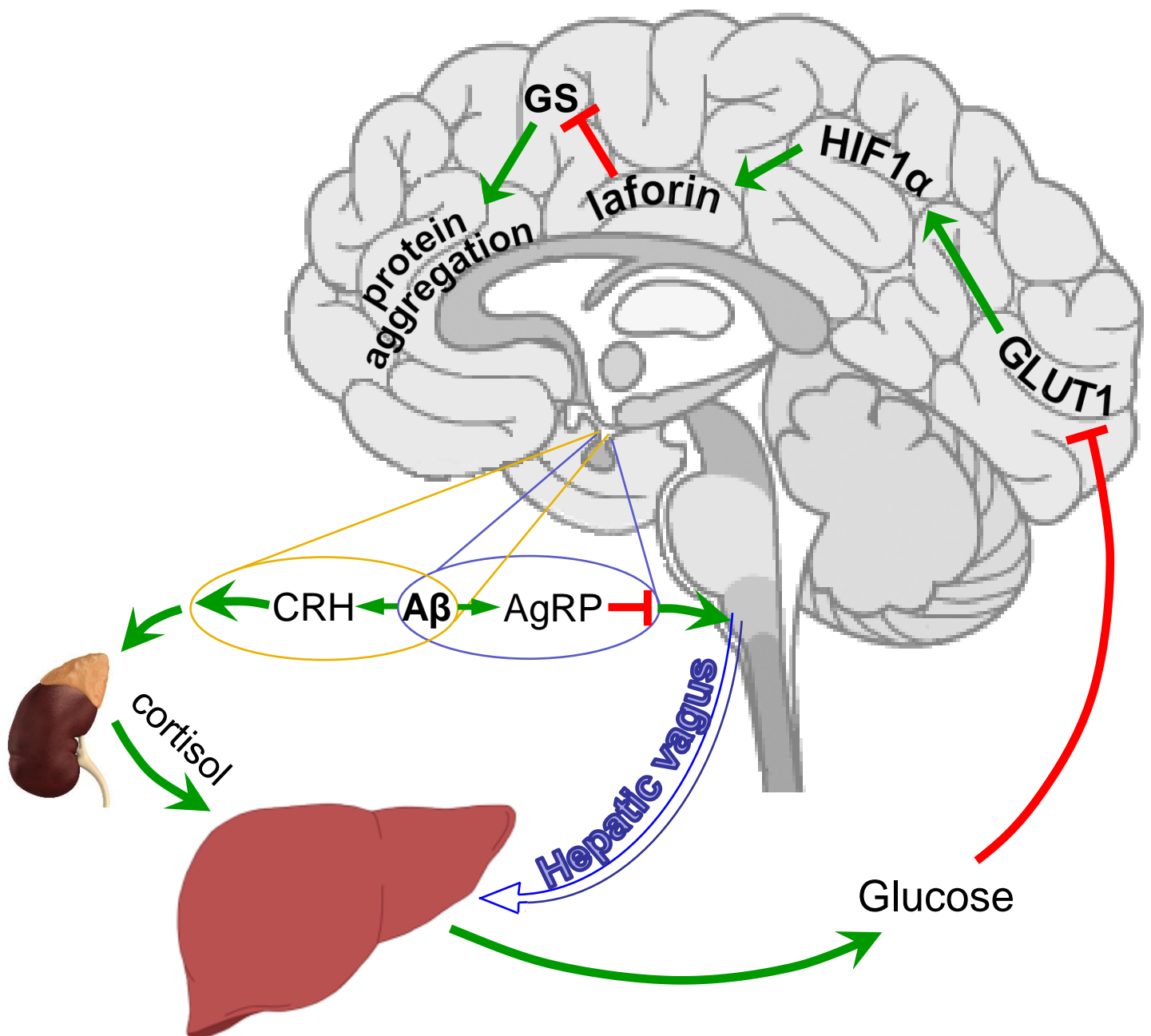
Animal models of Type-2 diabetes have elevated A β in the brain

Brain glucose utilization is reduced in Type-2 diabetes

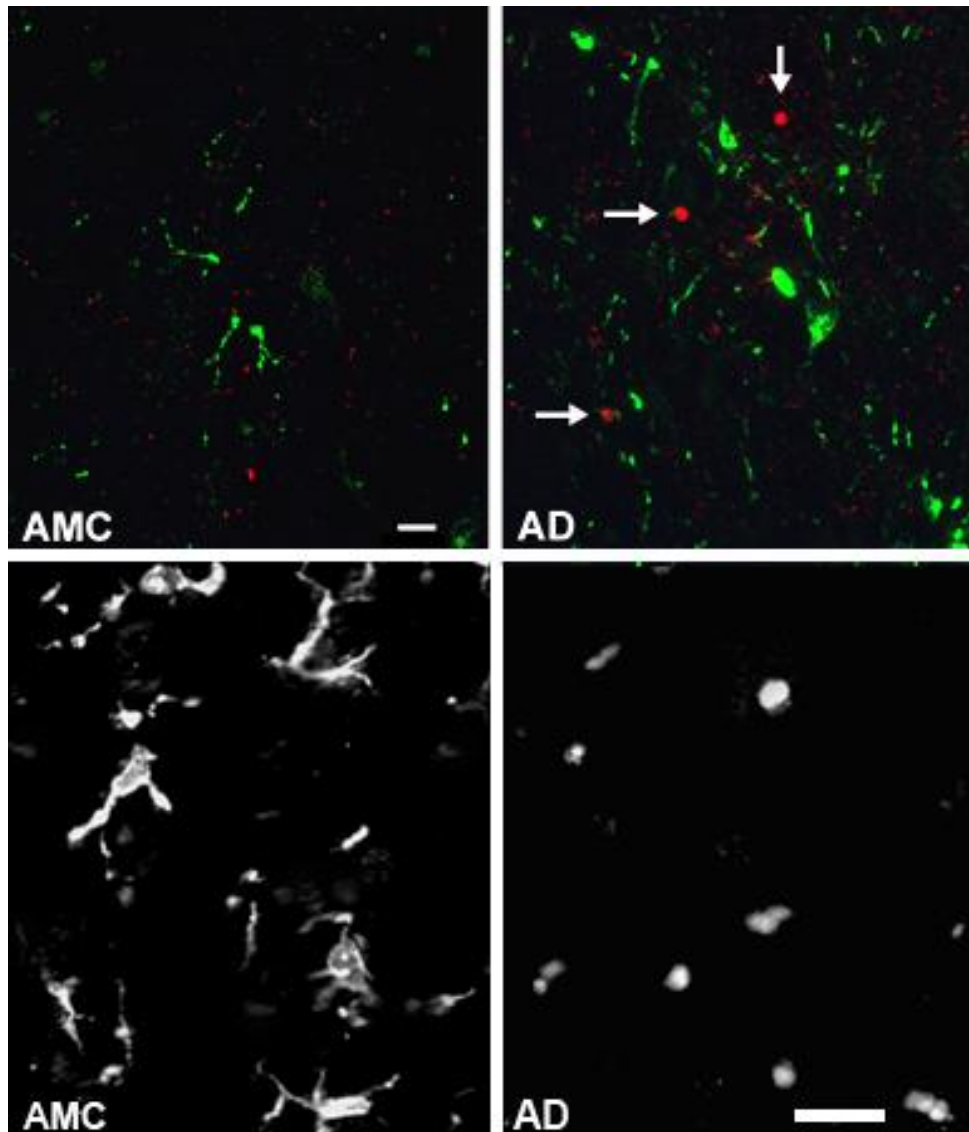


Brain glucose utilization is reduced
in Alzheimer's disease

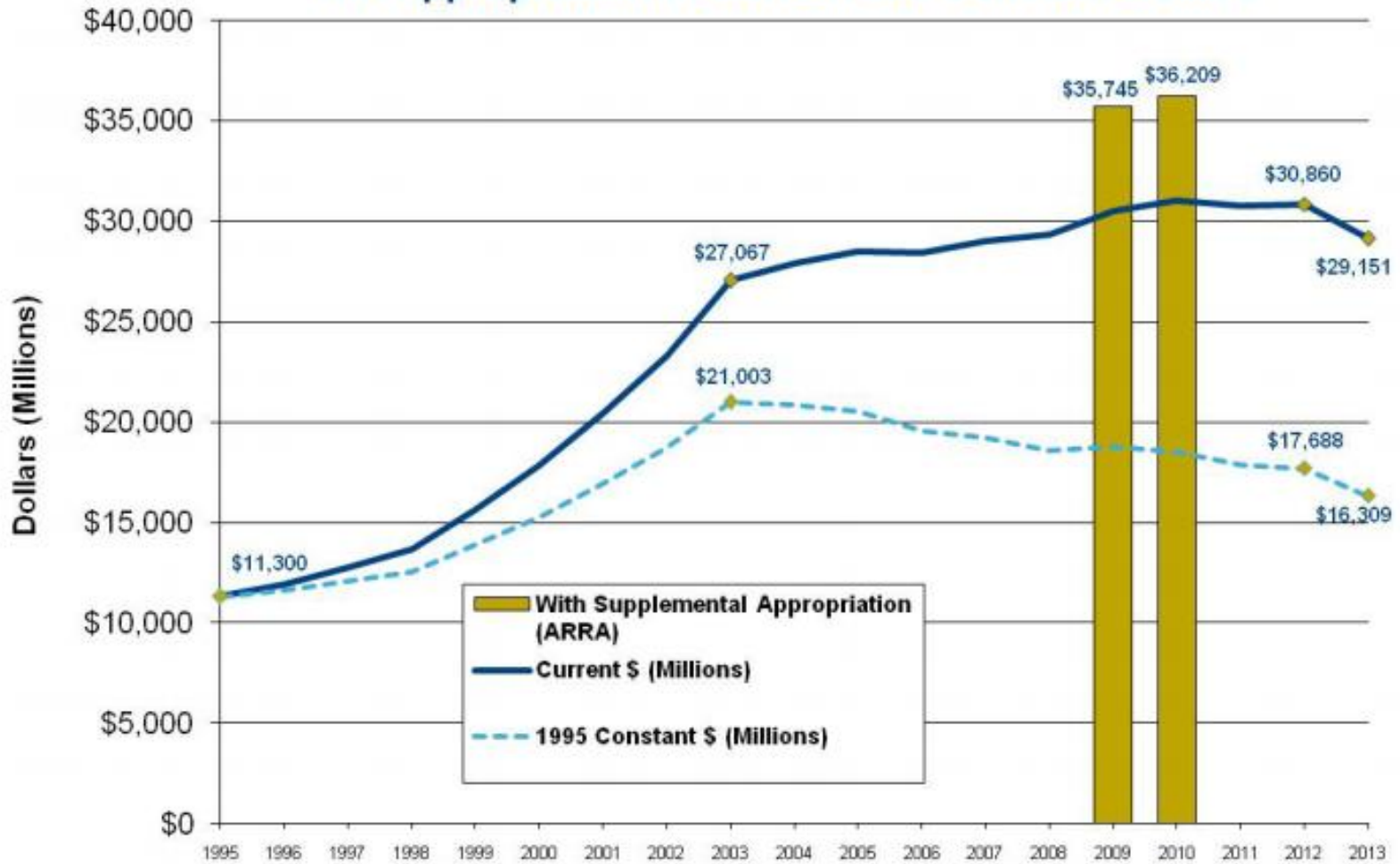




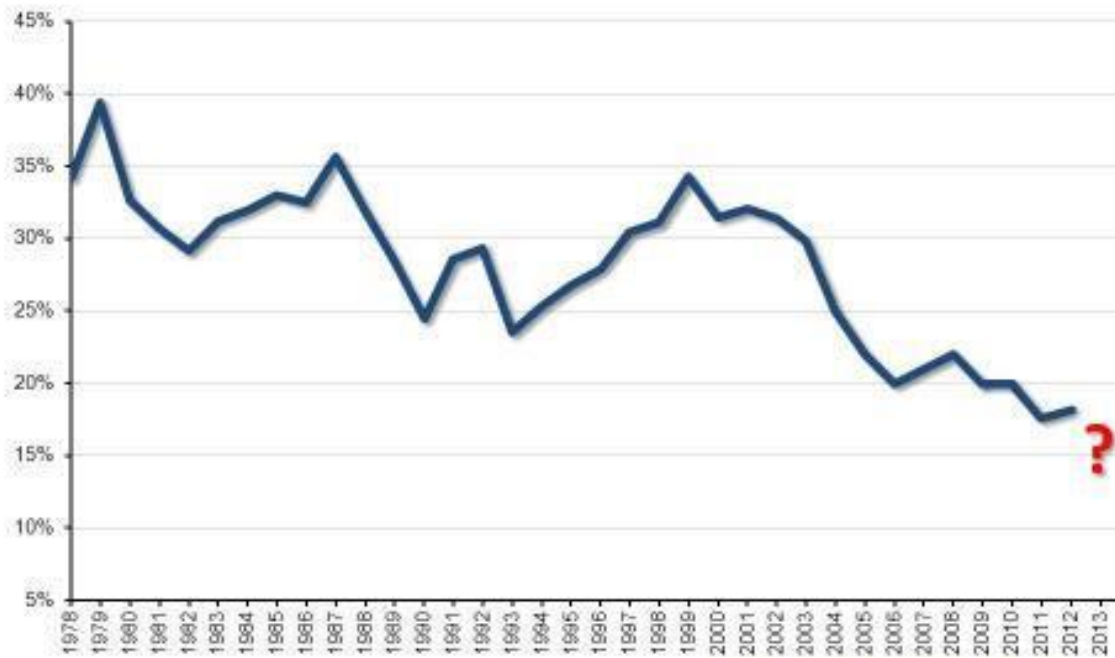
Neuroinflammation in AD hypothalamus



NIH Appropriation in Current and Constant Dollars



NIH Grant Application Success Rates FY 1978-2013



Source: NIH http://report.nih.gov/success_rates/

UAMS' Sue Griffin was honored with a Lifetime Achievement Award by the Alzheimer's Association



From 2000-2013, Sue Griffin was awarded

\$15,153,988

in NIH grant funds for work at UAMS

Together, she and I were awarded

\$28,443,322

in NIH grant funds for work at UAMS

Proposed budget to sustain the UAMS Alzheimer's "brain bank"

Principal Investigator/Program Director (Last, first, middle):

DETAILED BUDGET FOR INITIAL BUDGET PERIOD DIRECT COSTS ONLY					FROM 10/15/2016	THROUGH 10/14/2017	
PERSONNEL <i>(Applicant organization only)</i>		TYPE APPT. <i>(months)</i>	% EFFORT ON PROJ.	INST. BASE SALARY	DOLLAR AMOUNT REQUESTED <i>(omit cents)</i>		
NAME	ROLE ON PROJECT				SALARY REQUESTED	FRINGE BENEFITS	TOTAL
Steven W. Barger	Principal Investigator	12	5.0	57,434	2,872	718	3,590
[neuropathologist]	collaborator	12	10.0	186,800	18,680	4,670	23,350
[diener]	technician	12	25.0	32,960	8,240	2,060	10,300
[admin. assist.]	clerical	12	25.0	28,640	7,160	1,790	8,950
SUBTOTALS →							46,190
CONSULTANT COSTS							
EQUIPMENT <i>(Itemize)</i>							
ultra-low temperature freezers (2)							18,500
SUPPLIES <i>(Itemize by category)</i>							
Misc. histology chemicals							
							1,500
TRAVEL							
PATIENT CARE COSTS		INPATIENT					
		OUTPATIENT					

Together, she and I were awarded

\$ 2,031,666

per year

in NIH grant funds for work at UAMS

In 2014, we were awarded

\$ 147,500

in NIH grant funds for work at UAMS