Are dental X-rays causing the Alzheimer's epidemic?

Unifying hypothesis explains puzzling AD facts

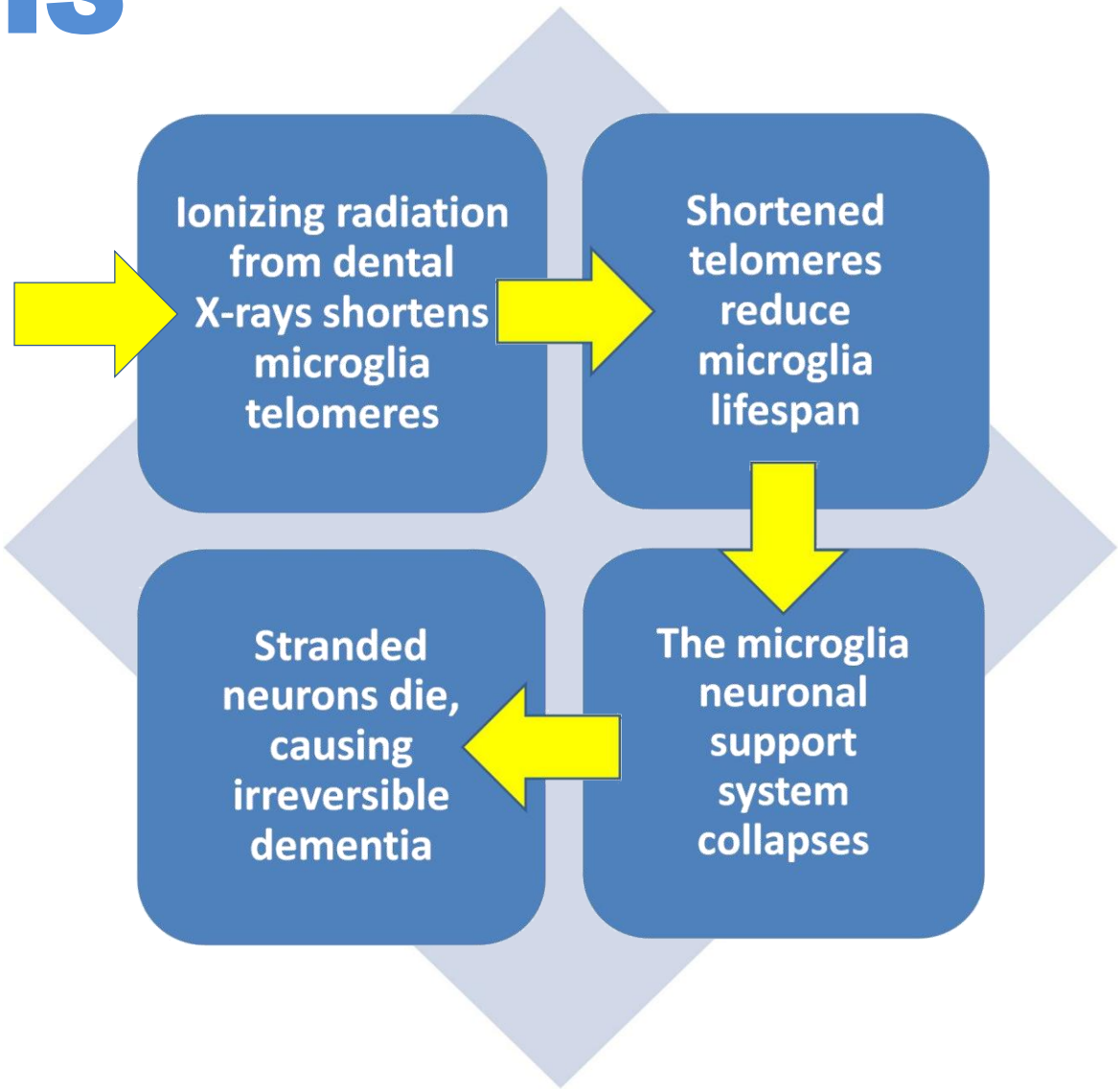
Caroline Rodgers 2012

Caroline Rodgers

caroline.rodgers@hotail.com

- Researcher & writer specializing in public health
- Author of “Dental X-ray exposure and Alzheimer’s disease: a hypothetical etiological association,” *Med Hypotheses*. 2011;77(1)29-34.
- Alzheimer’s Association International Conference (AAIC) 2011 Hot Topics Poster Presenter (PA-382)

HYPOTHESIS at a glance



Simply stated:

Head exposure to ionizing radiation is causing us to outlive the brain cells meant to support our neurons lifelong

Hypothesis foundation

❑ AD prevalence data

1. World Health Organization
2. 10/66 Dementia Research Group

❑ Dental health data

1. Indian Consumer Usage and Attitudes Survey 2009
2. Zhu L, Peterson PE, Wang HY, et al. 2005.
3. Summary Health Statistics U.S. 2008

❑ Scientific studies

1. Streit WJ, Braak H, et al. 2009[1]
2. Xue QS, Streit WJ, 2011[2]
3. Kalm M, Lannering B, et al. 2009[3]
4. Grodstein F, van Oijen M, et al. 2008[4]

(. . . and many others)

Dental visits & dementia: a sampling of countries

INDIA

- 67% have never visited a dentist[5]
- Dementia prevalence estimated at 1/5-1/4 that of Europe's[6]

CHINA

- 30% to 43% adults have never visited a dentist[7]
- Dementia prevalence about half of Europe's[6]

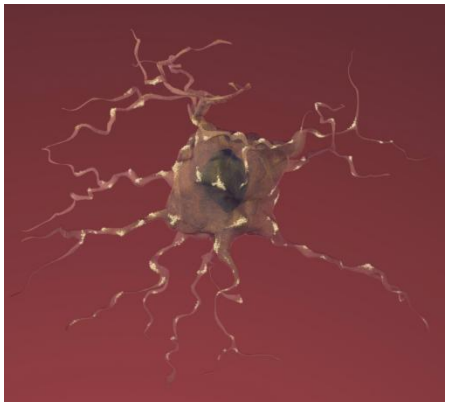
UNITED STATES

- 1% have never visited a dentist[8]
- 13% of people 65 and older have AD[9]

Puzzling AD facts explained

FACT:

The emergence of AD symptoms is delayed 10 or more years — when it is too late to stop or reverse it



Images courtesy of the National Institute on Aging /National Institutes of Health

Microglial telomere shortening would have a delayed effect on neurons because it reduces microglial lifespan, not function

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FACT:

AD mortality increased rapidly after 1979, making it the sixth leading cause of death by 2000

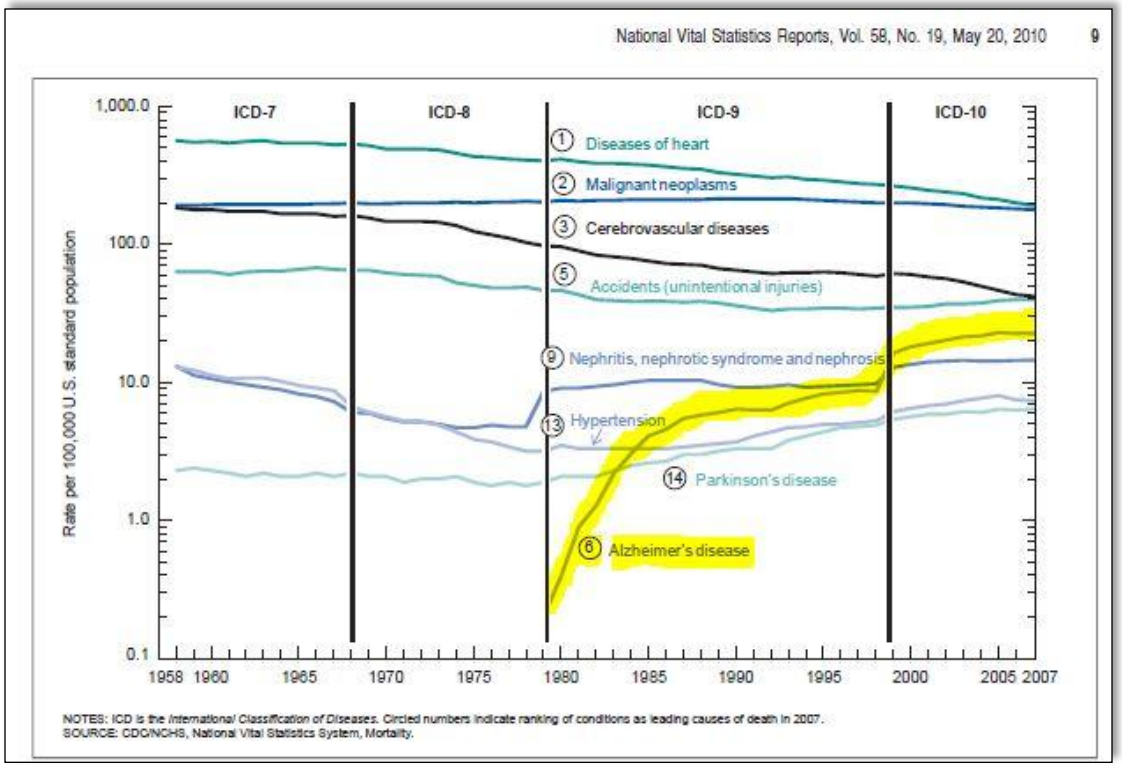


Figure 6. Age-adjusted death rates for selected leading causes of death: United States, 1958-2007
National Vital Statistics Reports, Vol. 58, No. 19, May 20, 2010.

Trends in national oral health habits

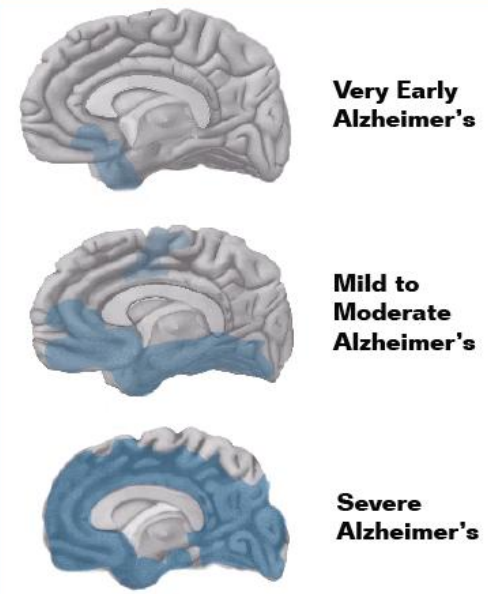
1940 **X-ray machines were in most U.S. dental offices**[10]

1957 **37% visited a dentist within year (18% never visited a dentist)**[11]

2008 **59% visited a dentist within year (1% never visited a dentist)**[8]

FACT:

The hippocampus is one of the first brain regions to suffer AD-related damage



As Alzheimer's disease progresses, neurofibrillary tangles spread throughout the brain (shown in blue). Plaques also spread throughout the brain, starting in the neocortex. By the final stage, damage is widespread and brain tissue has shrunk significantly.

Diagram courtesy of the National Institute on Aging /National Institutes of Health

It contains both microglia and neural progenitor cells that keep dividing, making them more susceptible to radiation-induced damage

FACT:

Men die sooner than women following an AD diagnosis[12]

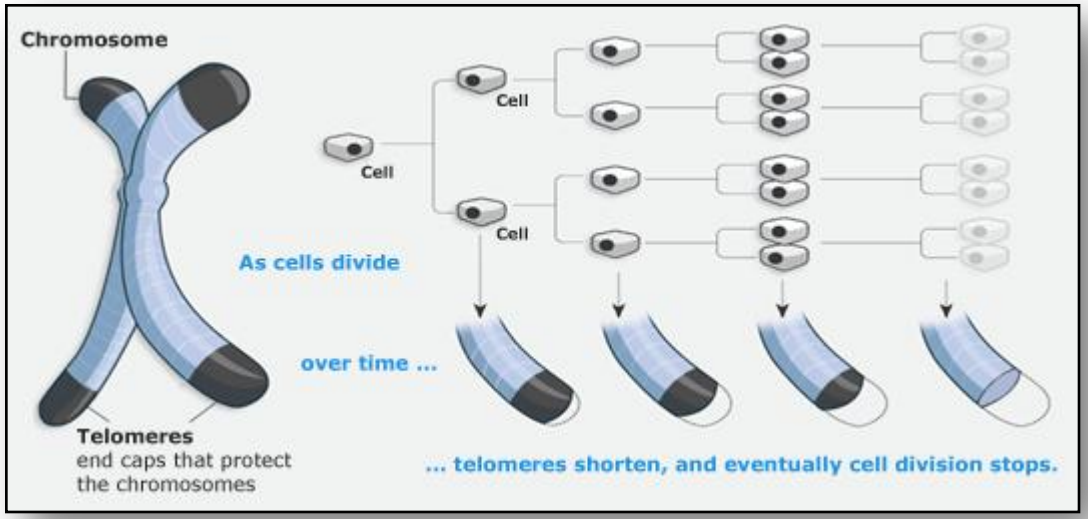


Diagram courtesy of tasciences.com

Older men have shorter telomeres than women the same age[13]

FACT:

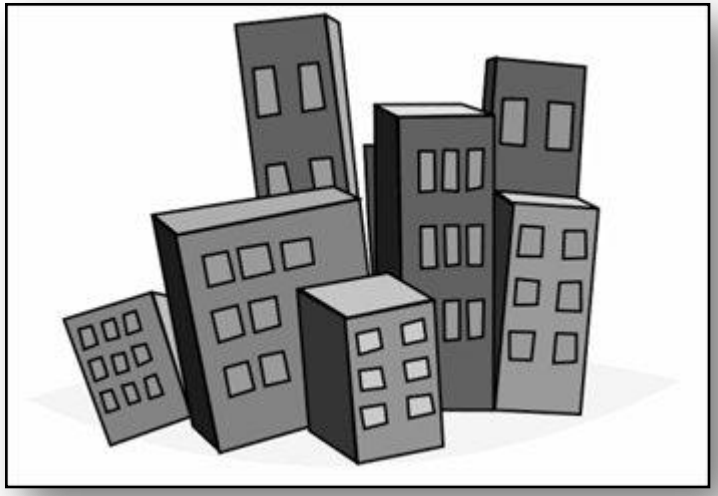
Virtually all people with Down syndrome have AD brain pathology by age 40 – but there is a wide variance in the onset of dementia[14,15]

People with Down syndrome lose telomere length faster than the general population, but just like others, there is variation in newborn telomere length[16,13]

Catherine Rodgers
1945-1995
Died of Alzheimer's at age 49

FACT:

AD prevalence is higher in urban areas[17]



City dwellers make more dental visits[18]

Graphic public domain image from :
http://www.clipartpal.com/clipart_pd/buildings/city_10063.html

FACT:

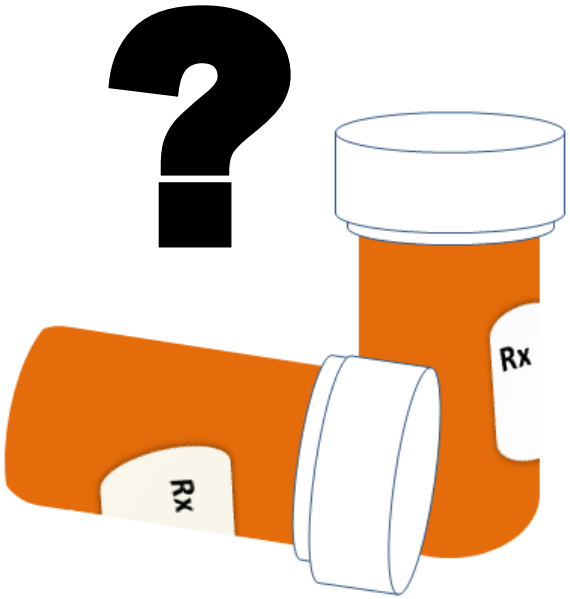
AD is increasing most rapidly in developing countries – especially Latin America[6]

Many countries started providing free dental care to all citizens in the last few decades, such as Cuba in 1976, Venezuela in 1999 and Brazil in 2004

Public domain image from:
http://www.clker.com/clipart-planet-earth-1.html

FACT:

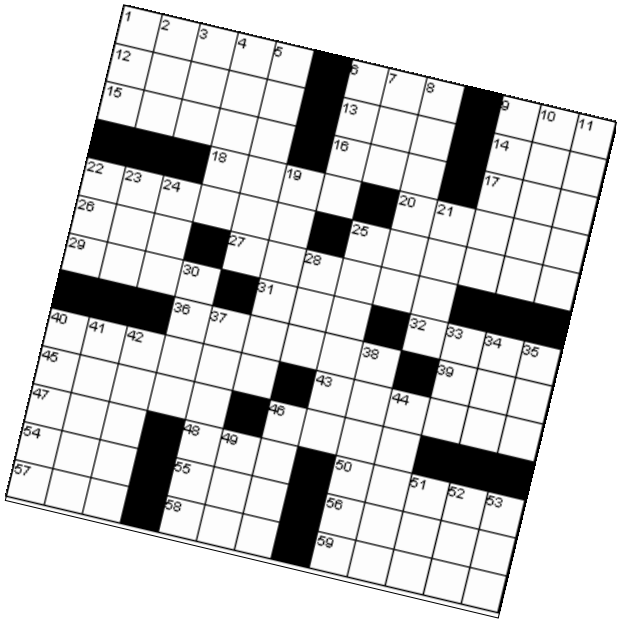
AD does not respond to anti-inflammatory or cholesterol-lowering drugs – even though it is associated with brain inflammation and high cholesterol[19,20]



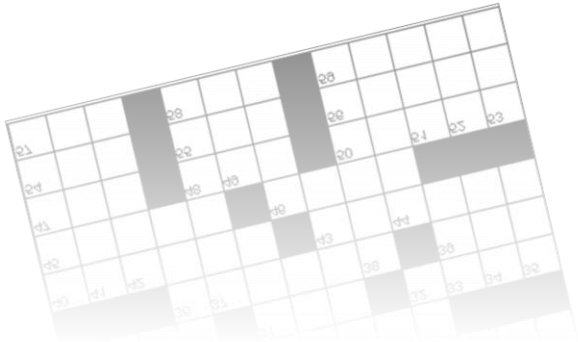
Neither treatment can help neurons that have lost their support system

FACT:

Mentally stimulating activities initially delay AD, yet ultimately accelerate it[21]



Additional brain growth would eventually overwhelm microglia struggling to support existing neuronal networks



Puzzle created by Crossword Weaver at:
http://www.varietygames.com/tight11.htm

Questions & Concerns

Could diligent dental care explain the increase in non-familial early-onset AD?

Could head X-rays after sports injuries contribute to early-onset dementia?

What are the long-term risks for orthodontia patients exposed to cone-beam CT scanners that produce 3-D images — at much higher radiation levels?

Do plateaus in declining cognition relate to intervals between X-ray exposures?

Could the ratio of dental professionals to population be used to create an algorithm to predict dementia trends?

If dental X-rays pose risks, could brain imaging utilizing ionizing radiation to monitor AD accelerate disease progression?

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