

National Alzheimer's Project Act (NAPA)

The information that follows was included as an attachment to an email submitted by the public.

For more information about NAPA, visit the NAPA website at:

<http://aspe.hhs.gov/national-alzheimers-project-act>

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

Unifying hypothesis explains puzzling AD facts

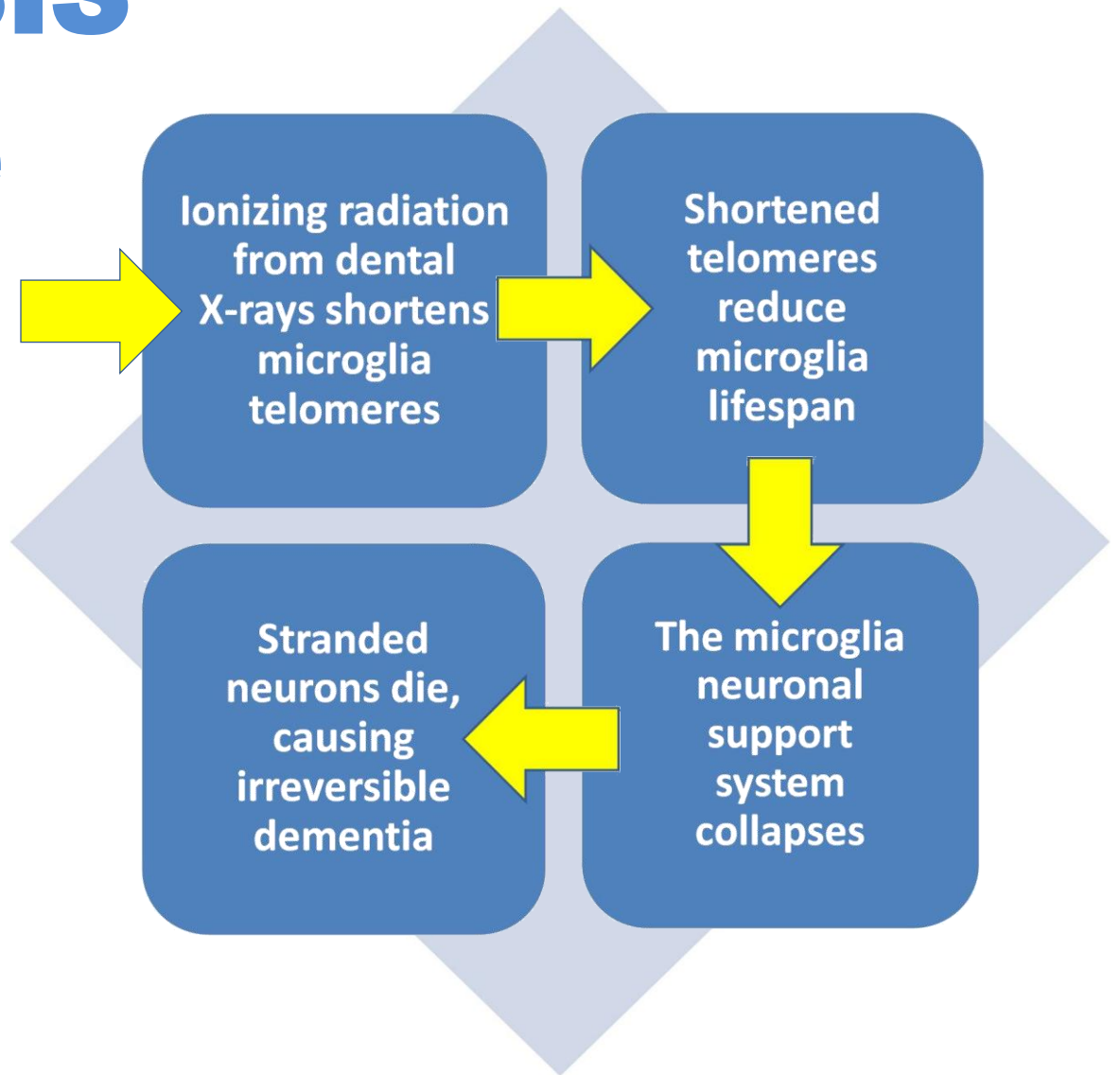
Caroline Rodgers

caroline.rodgers@hotmail.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)

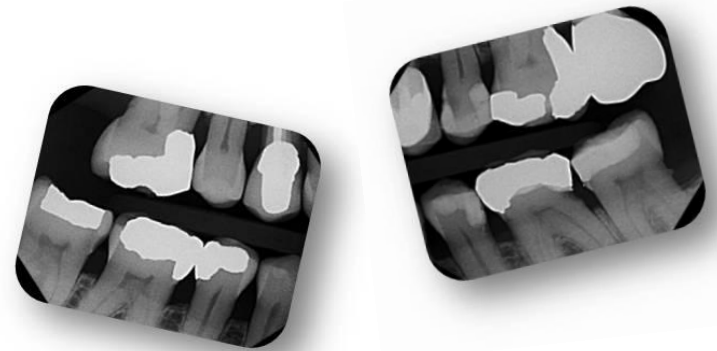
HYPOTHESIS

at a glance



Simply stated:

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



Dental visits & dementia: a sampling of countries

INDIA

- 67% have never visited a dentist⁵
- Dementia prevalence estimated at 1/5-1/4 that of Europe's⁶

CHINA

- 30% to 43% adults have never visited a dentist⁷
- Dementia prevalence about half of Europe's⁶

UNITED STATES

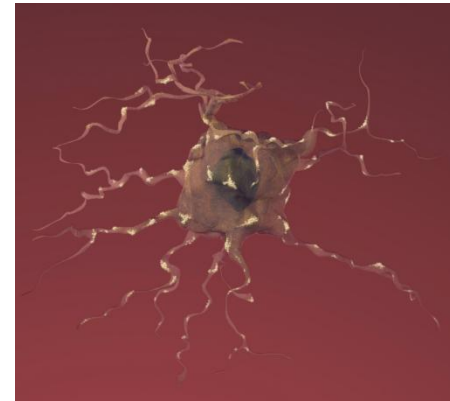
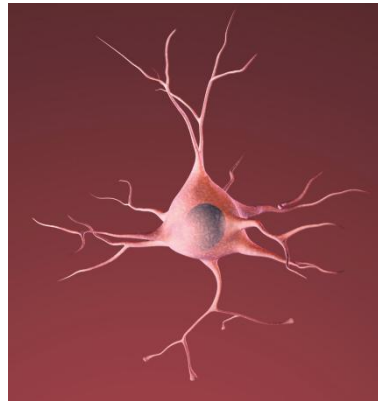
- 1% have never visited a dentist⁸
- 13% of people 65 and older have AD⁹

Testing the hypothesis

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

FACT:

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

Trends in national oral health habits

1940 X-ray machines were in most U.S. dental offices¹⁰

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

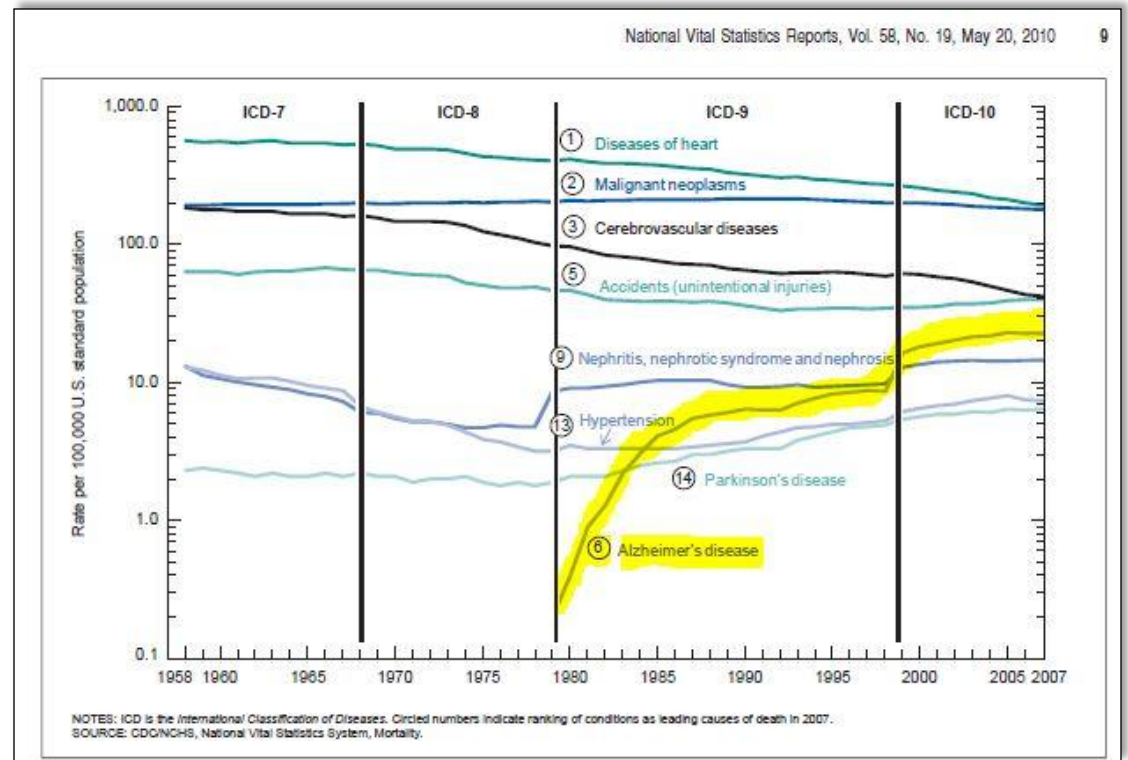


Figure 6. Age-adjusted death rates for selected leading causes of death: United States, 1958-2007
National Vital Statistics Reports, Vol. 58, No. 19, May 20, 2010.

FACT:

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

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

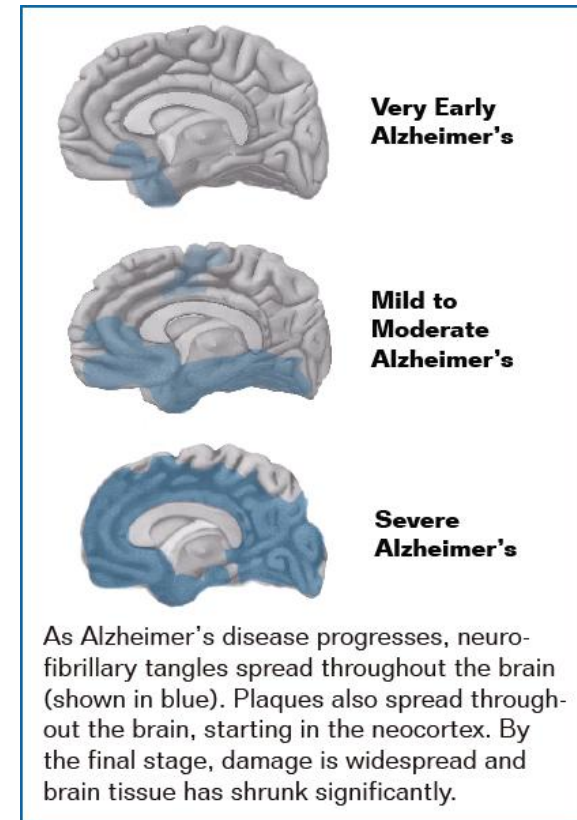


Diagram courtesy of the National Institute on Aging /National Institutes of Health

FACT:

Men die sooner than women following an AD diagnosis¹²

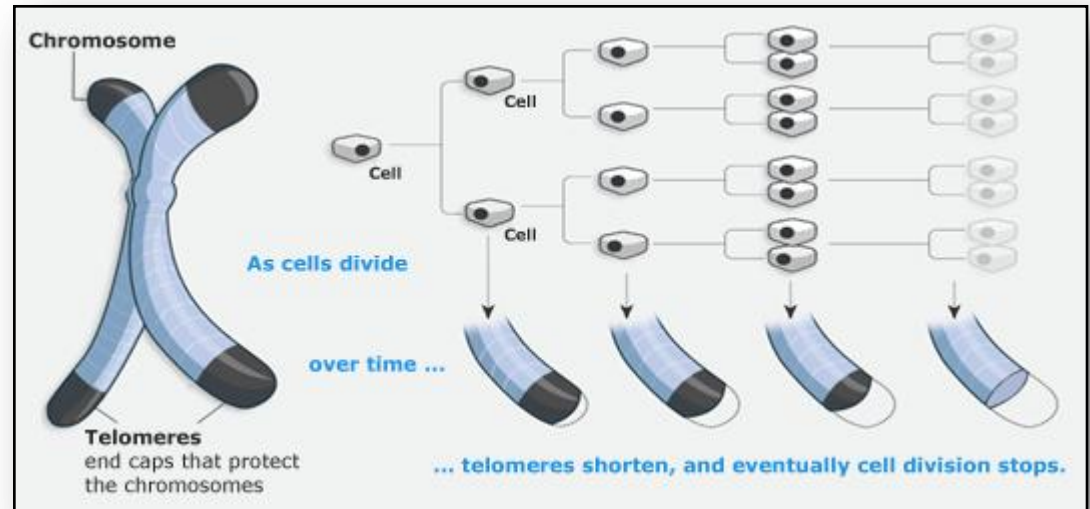


Diagram courtesy of tasciences.com

Older men have shorter telomeres than women the same age¹³

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}

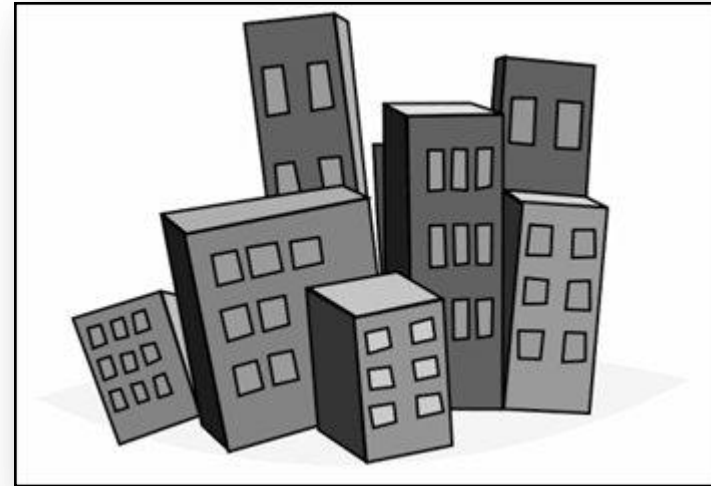
People with Down syndrome lose telomere length faster than the general population, but just like others, there is variation in newborn telomere length^{16,13}



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

FACT:

**AD prevalence
is higher in
urban areas¹⁷**



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

**City dwellers make
more dental visits¹⁸**

FACT:

AD is increasing most rapidly in developing countries – especially Latin America⁶



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}

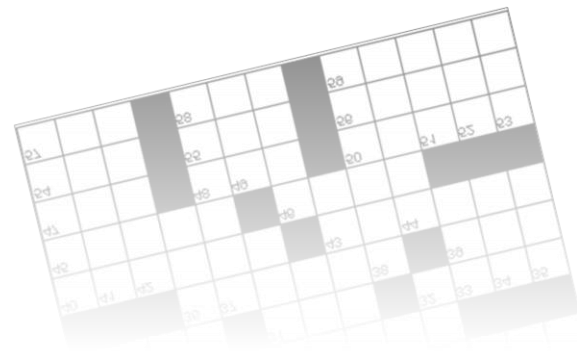
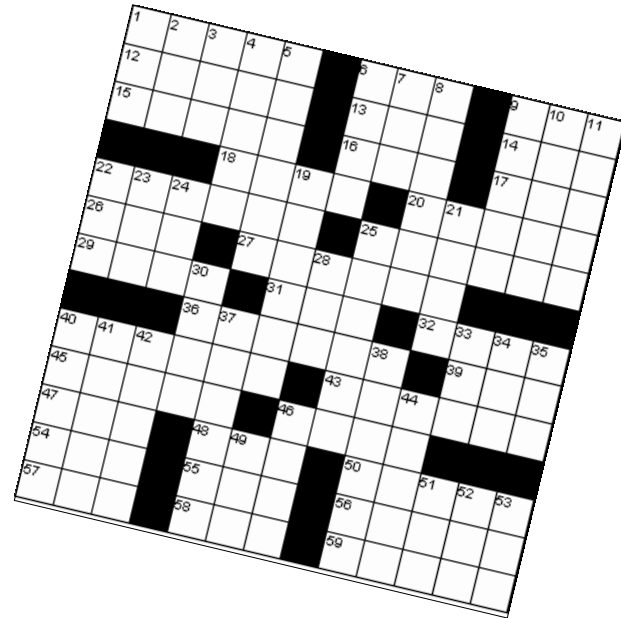
Neither treatment can help neurons that have lost their support system



FACT:

Mentally stimulating activities initially delay AD, yet ultimately accelerate it²¹

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



Questions & Concerns

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

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?

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?

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

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

REFERENCES

1. Streit WJ, Braak H, Xue QS, et al. Dystrophic (senescent) rather than activated microglial cells are associated with tau pathology and likely precede neurodegeneration in Alzheimer's disease. *Acta Neuropathol.* 2009;118(4):475-85. Epub 2009 Jun 10.
2. Xue QS, Streit WJ. Microglial pathology in Down syndrome. *Acta Neuropathol.* 2011;122(4):455-66. Epub 2011 Aug 17..
3. Kalm M, Lannering B, et al. Irradiation-induced loss of microglia in the young brain. *J Neuroimmunol.* 2009;206(1-2):70-5. Epub 2008 Dec 13.
4. Grodstein F, van Oijen M, Irizarry MC, et al. Shorter telomeres may mark early risk of dementia: preliminary analysis of 62 participants from the nurses' health study. *PLoS One.* 2008;3(2):e.1590.
5. Indo-Asian News Service. 67 percent Indians have never visited a dentist: Survey. http://www.thaindian.com/newsportal/health/67-percent-indians-have-never-visited-a-dentist-survey_100236506.html Aug 22 2009. Accessed Jul 9 2010.
6. Llibre Rodriquez JJ, Ferri CP, Acosta D, et al. Prevalence of dementia in Latin America, India, and China: a population-based cross-sectional survey. *Lancet.* 2008;372(9637):464-74. Epub 2008 Jul 25.
7. Zhu L, Peterson PE, Wang HY, et al. Oral health knowledge, attitudes and behaviour of adults in China. *Int Dent J* 2005;55(4):231-41.
8. S Pleis JR, Lucas JW, Ward BW. Summary health statistics for U.S. adults: National Health Interview Survey, 2008. *Vital Health Stat.* 2009;10(242):1-157.
9. Alzheimer's Association. 2011 Alzheimer's Disease Facts and Figures. http://www.alz.org/downloads/Facts_Figures_2011.pdf Accessed Jan 13 2012.
10. Frommer HH. The History of Dental Radiology. *Tex Dent J.* 2002;119(5):416-21, 423.
11. U.S. National Health Survey. Dental care interval and frequency of visits. United States July 1957-June 1959. Washington, U.S. Dept. of Health, Education, and Welfare, Public Health Services, Division of Public Health Methods, 1960 .
12. Larson EB, Shadlen MF, Wang LI, et al. Survival after Initial Diagnosis of Alzheimer Disease. *Ann Intern Med* 2004;140(7):501-9 .
13. Benetos A, Okuda K, Lajemi M, et al. Telomere length as an indicator of biological aging: the gender effect and relation with pulse pressure and pulse wave velocity. *Hypertension* 2001;37(2 Part 2):381-5.
14. Karlinsky H. Alzheimer's disease in Down's syndrome. A review. *J Am Geriatr Soc.* 1986;34(10):728-34.
15. Stanton LR, Coetzee RH. Down's syndrome and dementia. *Advances in Psychiatric Treatment.* 2004;10:50-8. <http://apt.rcpsych.org/content/10/1/50.full.pdf+html> Accessed Jan 15 2012.
16. de Arruda Cardoso Smith M, Borsatto-Galera B, Feller RI, et al. Telomeres on chromosome 21 and aging in lymphocytes and gingival fibroblasts from individuals with Down syndrome. *J Oral Sci.* 2004;46(3)171-7.
17. World Health Organization. Mental Health and Substance Abuse. Facts and Figures, Alzheimer's Disease: the Brain Killer. http://www.searo.who.int/en/Section1174/Section1199/Section1567/Section1823_8066.htm Last update Aug 18 2006. Accessed Jul 7 2010.
18. Fos P, Hutchison L. (2003) The State of Rural Oral Health: A literature review. Rural Healthy People 2010: A companion document to Healthy People 2010. Vol. 2. College Station. TX: The Texas A&M University System Health Science Center, School of Rural public Health, Southwest Rural Health Research Center.
19. McGuinness B, O'Hare J, Craig D, et al. Statins for the treatment of dementia. *Cochrane Database Syst Rev.* 2010: Aug 4;(8):CD007514.
20. ADAPT Research Group, Martin BK, Szekely C, et al. Cognitive function over time in the Alzheimer's Disease Anti-inflammatory Prevention Trial (ADAPT): results of a randomized, controlled trial of naproxen and celecoxib. *Arch Neurol* 2008;65(7):896-905. Epub 2008 May 12.
21. Wilson RS, Barnes LL, Aggarwal NT, et al. Cognitive activity and the cognitive morbidity of Alzheimer disease. *Neurology* 2010;75(11):990-6. Epub 2010 Sep 1.