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

Unifying hypothesis explains puzzling AD facts
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Alzheimer’s Association International Conference (AAIC) 2011 Hot Topics Poster Presenter (PA-382)
What is causing Alzheimer's disease?

**HYPOTHESIS at a glance**

- Ionizing radiation from dental X-rays shortens microglia telomeres
- Stranded neurons die, causing irreversible dementia
- Shortened telomeres reduce microglia lifespan
- The microglia neuronal support system collapses

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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

- **Scientific studies**
  2. Xue QS, Streit WJ, 2011²

  (... and many others)

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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\(^9\)
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.

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

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

1957  37% visited a dentist within year (18% never visited a dentist)

2008  59% visited a dentist within year (1% never visited a dentist)

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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.
FACT:

Men die sooner than women following an AD diagnosis\(^ {12}\)

Older men have shorter telomeres than women the same age\(^ {13}\)

Diagram courtesy of tasciences.com
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\textsuperscript{17}

City dwellers make more dental visits\textsuperscript{18}

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

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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

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FACT:

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

Neither treatment can help neurons that have lost their support system
FACT:

Mentally stimulating activities initially delay AD, yet ultimately accelerate it\textsuperscript{21}

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?

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?

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?

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

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REFERENCES


