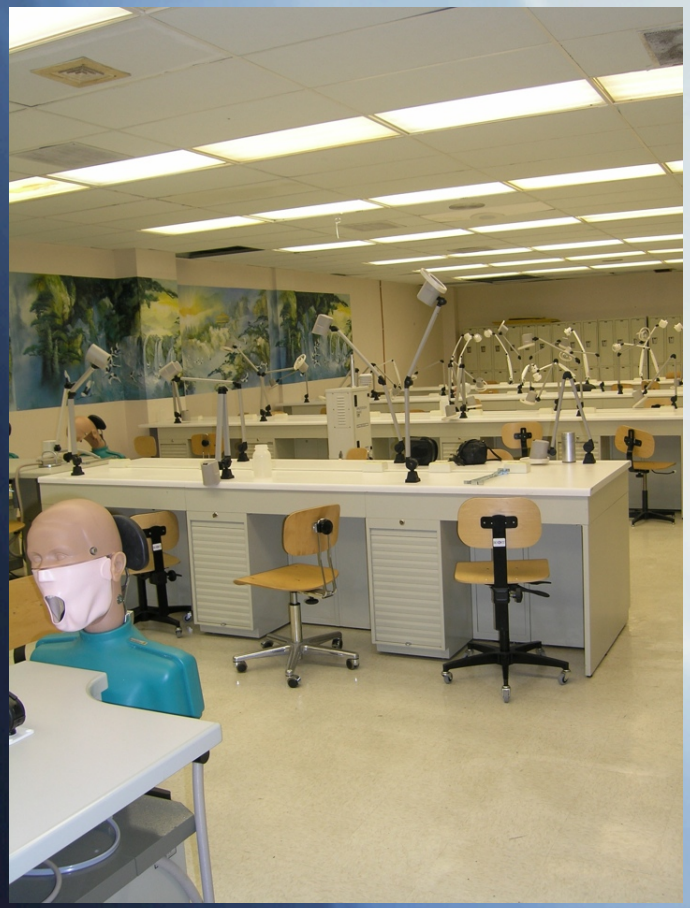
What should dentists know about amalgams

- What should I let my patients know so that they feel conformable about our relationship

  - What ever the truth might be it can only relax on our best judgement of knowledge

Exposure




Llama ahora

What is amalgam

- First introduced in France in the early 1800s. Currently, dental amalgams are composed of 43-54% mercury and the remaining powder is made up of mainly silver (~20-35%) and some tin, copper (~10%), and zinc (~2%).

The beginning

- In 1840, the American Society of Dental Surgeons was founded by a group of dentists who met in New York city. In 1845, the ASDS had members sign a mandatory pledge promising not to use mercury fillings because of fear of mercury poisoning in patients but dentists continued using it. Some dentist were band from the Society because they continued the use of amalgams. The Society of Dental Surgeons declined, and due to the loss of members, the organization disbanded in 1856.

Interesting Times

- In 1859, the American Dental Association (ADA) was founded by twenty-six delegates representing various dental societies in the United States at a meeting in Niagara Falls, New York.
- In 1882 the first study was published in the Ohio State Journal of Dental Science by Dr. Eugene S. Talbot who reported mercury vapors released from amalgams.
- The ADA maintained until 1984 that mercury was bound in amalgam and did not release mercury vapor.
- In the 1970s studies demonstrated that a small amount of mercury vapor was constantly being released from amalgams corroborating 1882 study.

Why is mercury used in amalgams

- Mercury is used in amalgam because it helps make the filling material pliable. Mixed with an alloy powder, it creates a compound that is soft enough to mix and press into the tooth cavity.
- It hardens quickly and can withstand the forces of biting and chewing.
- Dental amalgam has been used as a dental restorative material for over 150 years. Amalgam remains popular because it is strong, durable and relatively inexpensive. Roughly 200 million restorative procedures performed in 1990 used amalgam

However you will also hear today the mayor argument

- It has not been demonstrated to cause any harm and therefore, there the benefits over-rides the risk

Today I hope to present enough evidence to increase the level of awareness in the new generation of dentists a well as the their teachers.

Gamma-2-phase amalgam formula in 1895

The gamma-2-phase amalgams contain approximately equal parts 50% of liquid mercury and 50% of an alloy powder containing;

* > 65% silver (Ag)
- * < 29% tin (Sn)
- * < 6% copper (Cu)
- * < 2% zinc (Zn)
- * < 3% mercury (Hg)

In 1970, the ingredients changed to the new non-gamma-2 form also known “high-copper" amalgams)

- * > 40% silver (Ag)
- * < 32% tin (Sn)
- * < 30% copper (Cu)
- * < 2% zinc (Zn)
- * < 3% mercury (Hg)

lower manufacturing cost, greater mechanical strength, and better corrosion resistance

Highly poisonous

- A Dartmouth professor studying– dimethyl mercury – spilled two drops of it on her gloved hand. The first sign of mercury poisoning occurred four months later when her speech began to be slurred. This was followed by difficulty walking and loss of vision. She then fell into a coma and died.

- Another person, attempting to smelt the silver in dental amalgams he obtained (they are 35 percent silver, 50 percent mercury, and 15 percent tin, zinc, and other metals), heated them in a frying pan. The mercury vapor thus generated, killed him quickly. The two other family members in the house at the time also died.

Why has amalgams been restricted in other countries

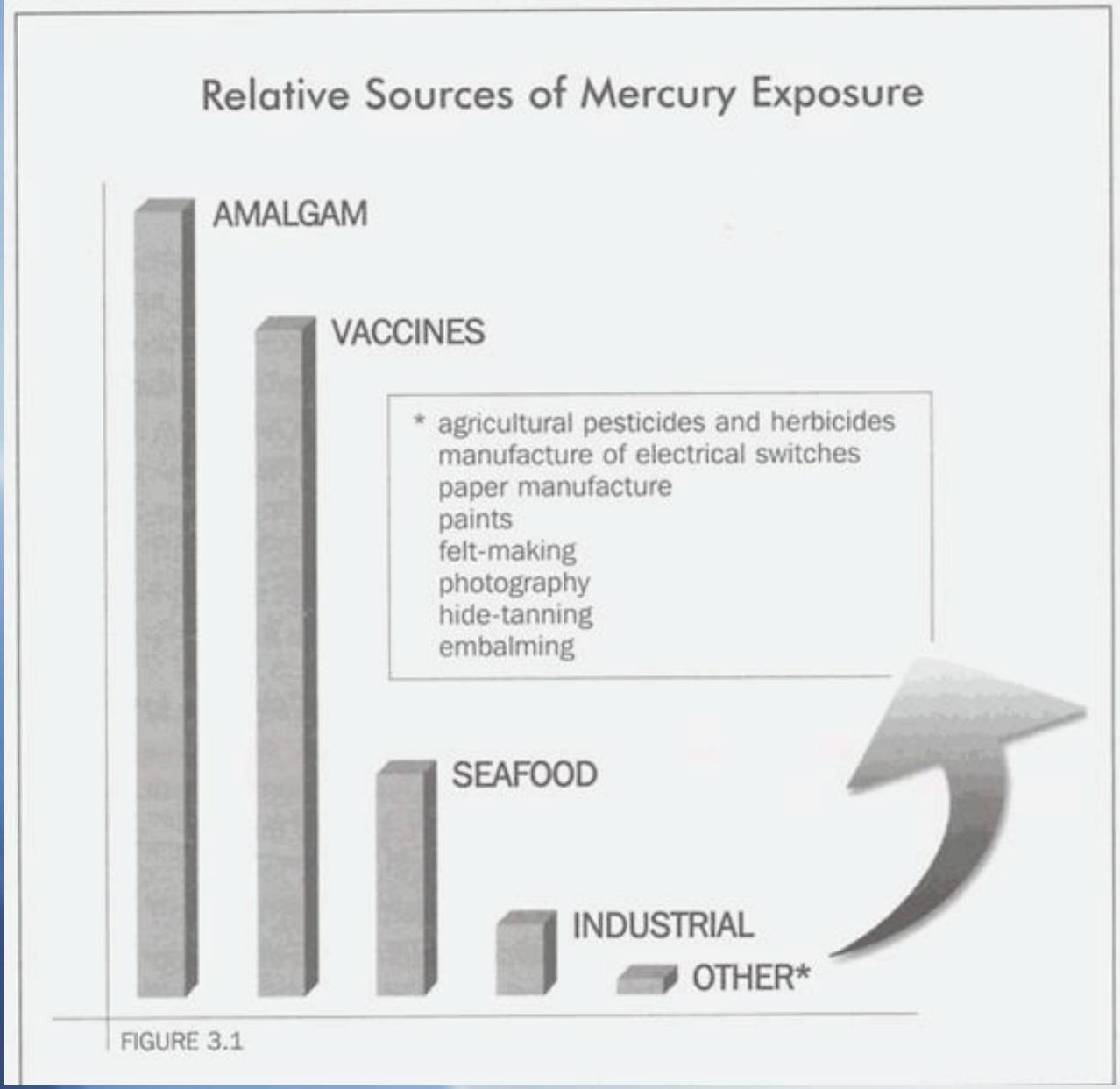
- Amalgams are used in many countries although Norway, Denmark and Sweden are notable exceptions.

Dental Amalgms

- 1-3 µg/day (FDA), or as high as 27 µg/day (Patterson)

- The FDA's assertion that there is no scientific evidence of health risks associated with amalgam is based on periodic reviews of scientific literature it has published in so-called "white papers". But in September 2006, a joint meeting of three FDA committees voted that the most recent FDA white paper was limited in scope, had gaps in knowledge regarding exposure limits, included contradictory evidence, did not include data from other countries, and did not provide a rationale for excluding some studies.

Mayor sources of Hg



Some things to know about Dental Amalgams

- The dental amalgam controversy
- potential cause of chronic illnesses, autoimmune disorders, neurodegenerative diseases, birth defects, oral lesions, and mental disorders

Toxicity

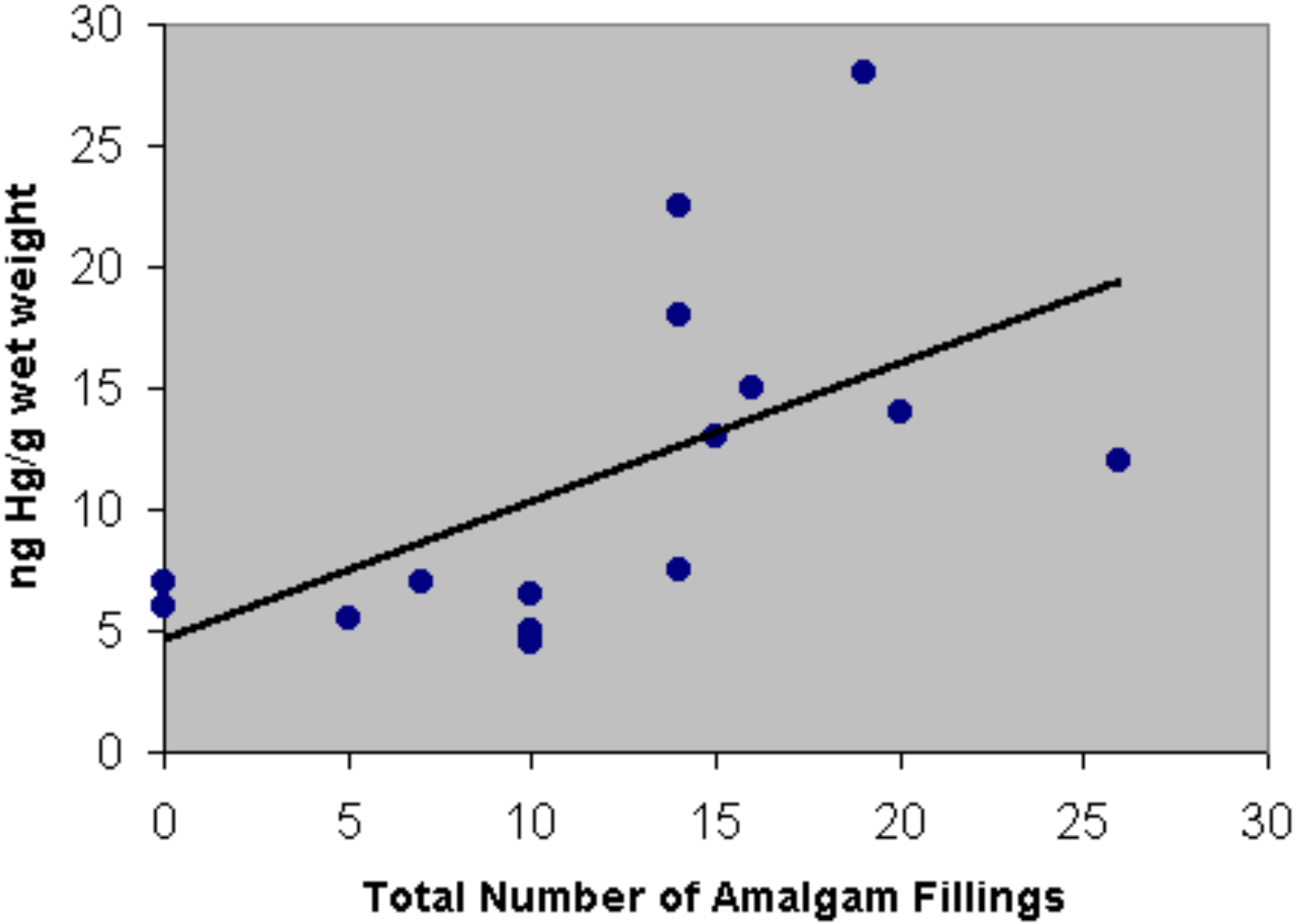
- Has been in use in dentistry for 150 years, consists of 50 % elemental mercury and a mixture of silver, tin, copper and zinc. Mercury accumulates in some organs, particularly in the brain, where it can bind to protein more tightly than other heavy metals (e. g. lead, cadmium). Therefore, the elimination half time is assumed to be up to 1 - 18 years in the brain and bones.

Effects of inorganic Hg

http://www.youtube.com/watch?v=lCzT1yuau_4
Neuro Toxin

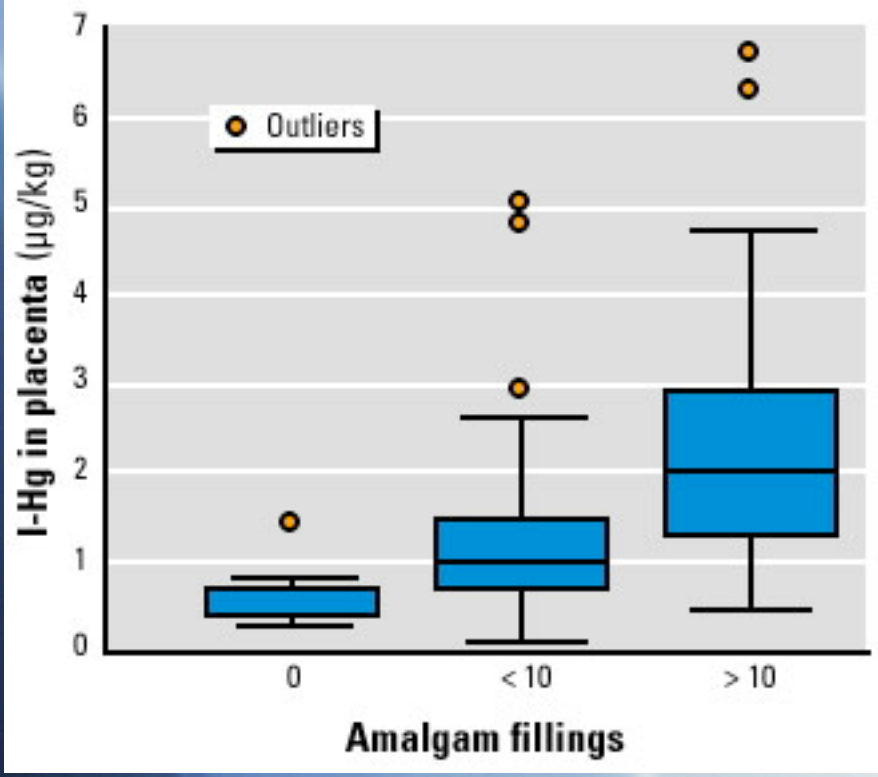
Strong correlation between amalgams fillings and concentration of Hg in the Brain and kidneys of autopsies

- Nylander M, Friberg L, Lind B (1987). "Mercury concentrations in the human brain and kidneys in relation to exposure from dental amalgam fillings". Swedish Dental Journal 11 (5): 179–87. PMID 3481133.


ng Hg/g wet weight
30
25
20
15
10
5
0
0
5
10
15
20
25
30
Total Number of Amalgam Fillings

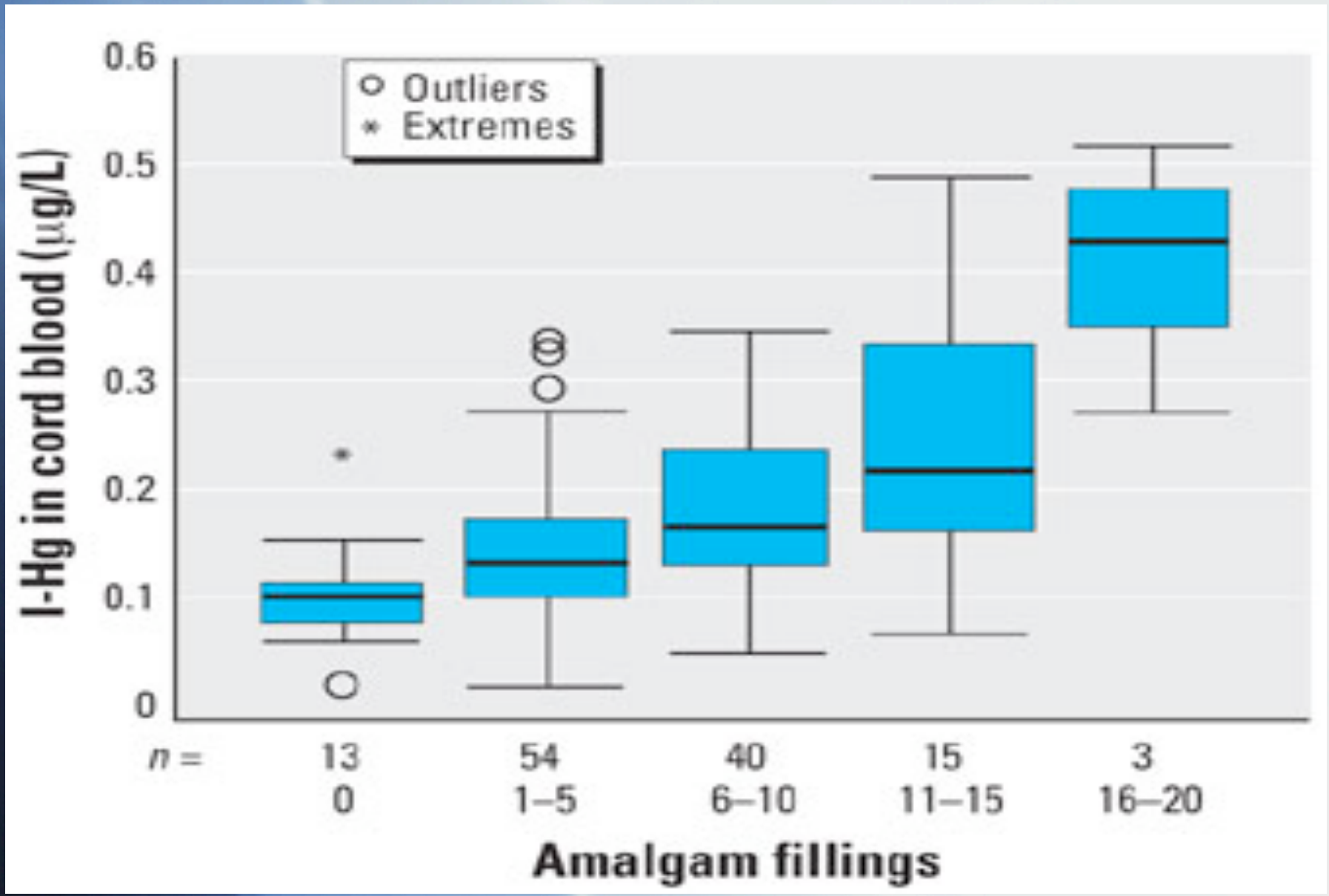
c
b
d
g

Pregnant women

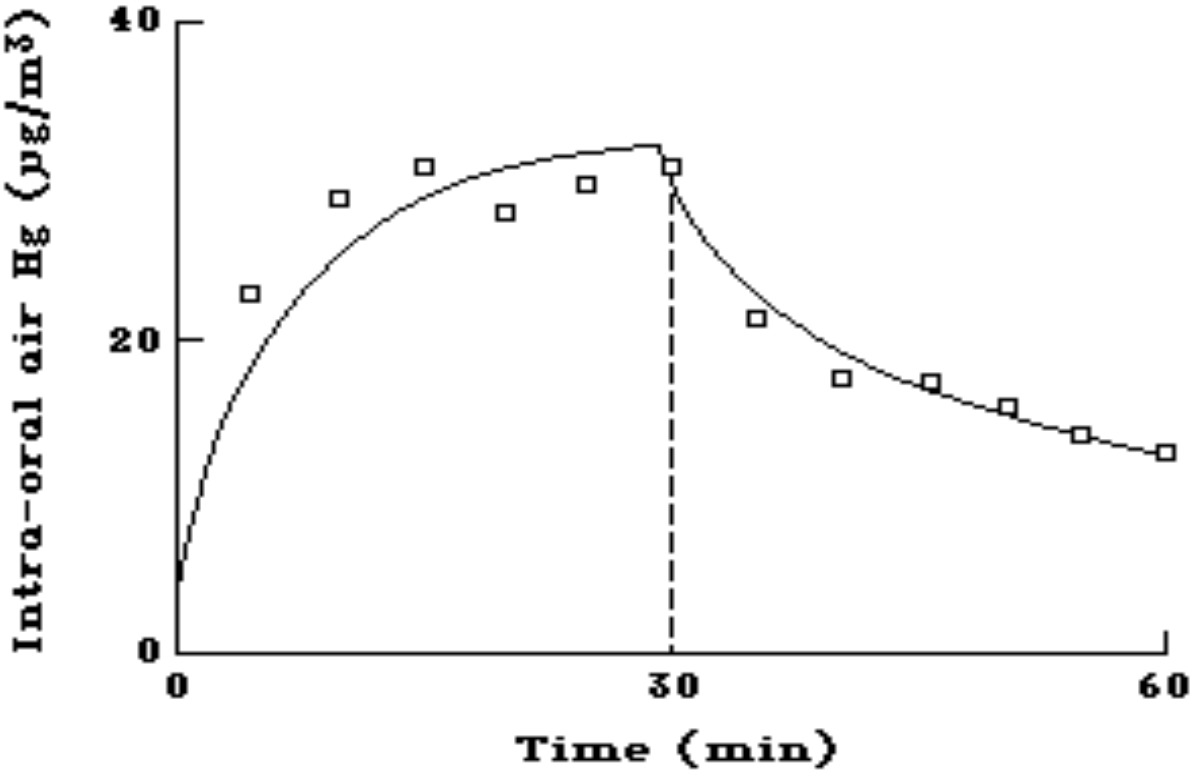


On average, 60% of placental Hg was in the form of MeHg. The median concentration was 1.8 µg/kg (range, 0-6.2 µg/kg wet weight) , more than twice the maternal blood concentration.

Karolin Ask, Agneta Åkesson, Marika Berglund, and Marie Vahter.
norganic Mercury and Methylmercury in Placentas of Swedish Women
Environmental Health Perspectives. Volume 110, Number 5, May 2002


I-Hg in cord blood (µg/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
Outliers
Extremes
n =
13
0
54
1–5
40
6–10
15
11–15
3
16–20
Amalgam fillings

Hg in intra-oral air



Mean concentrations of mercury in intra-oral air during 30 min of chewing stimulation, followed by 30 min with no stimulation, in 35 randomly selected subjects with dental amalgam restorations.
From: Vimy & Lorsheider (1985b).

The beneficial effect of amalgam replacement on health in patients with autoimmunity

- Systemic lupus, multiple sclerosis, autoimmune thyroiditis or atopic eczema, often show increased lymphocyte stimulation by low doses of inorganic mercury in vitro. The patients often report clinical metal hypersensitivity, especially to nickel.

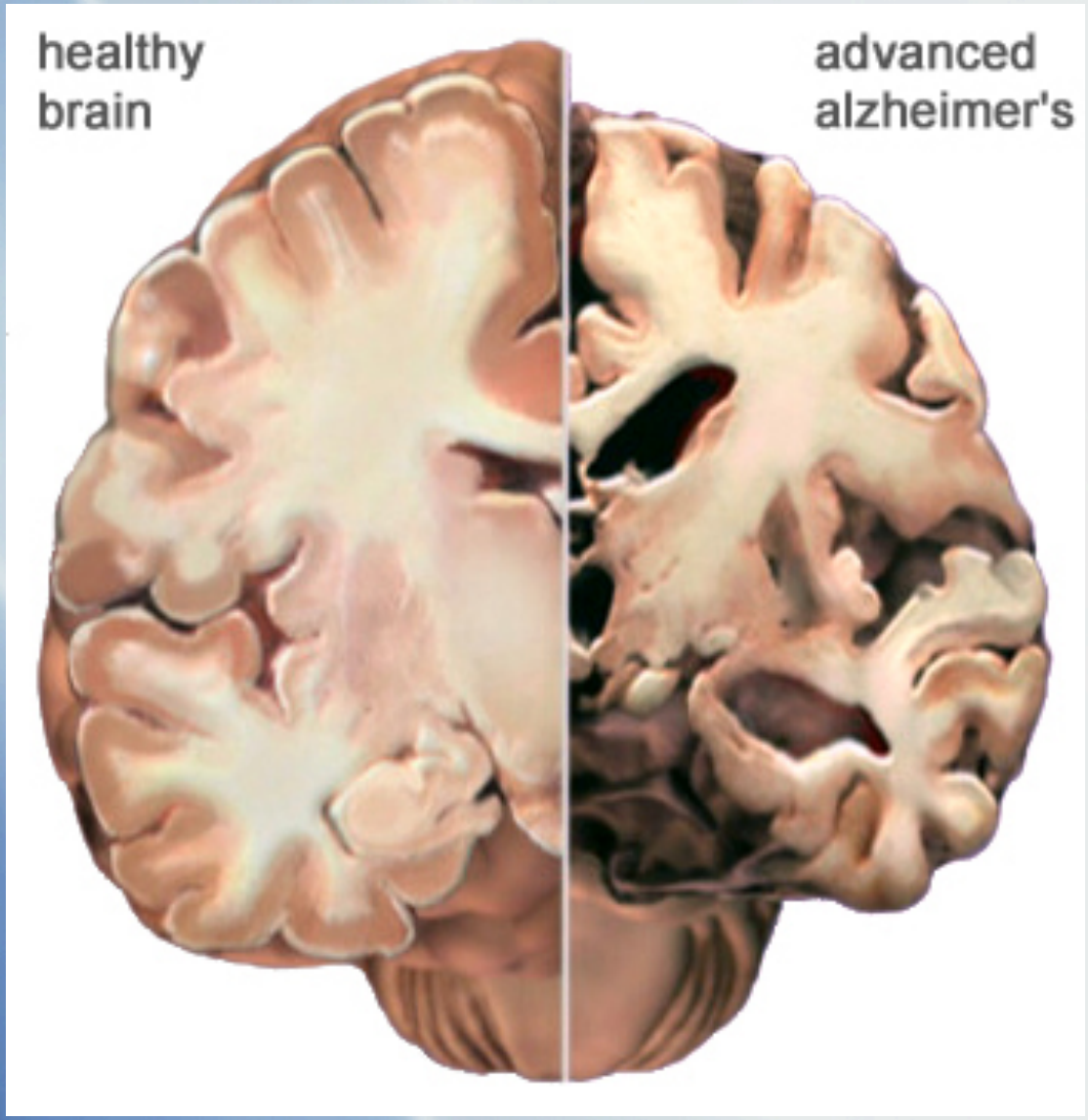
- O Jarmila Prochazkova, Ivan Sterzl, Hana Kucerova, Jirina Bartova & Vera DM Stejskal. Neuroendocrinology Letters No.3 June Vol.25, 2004

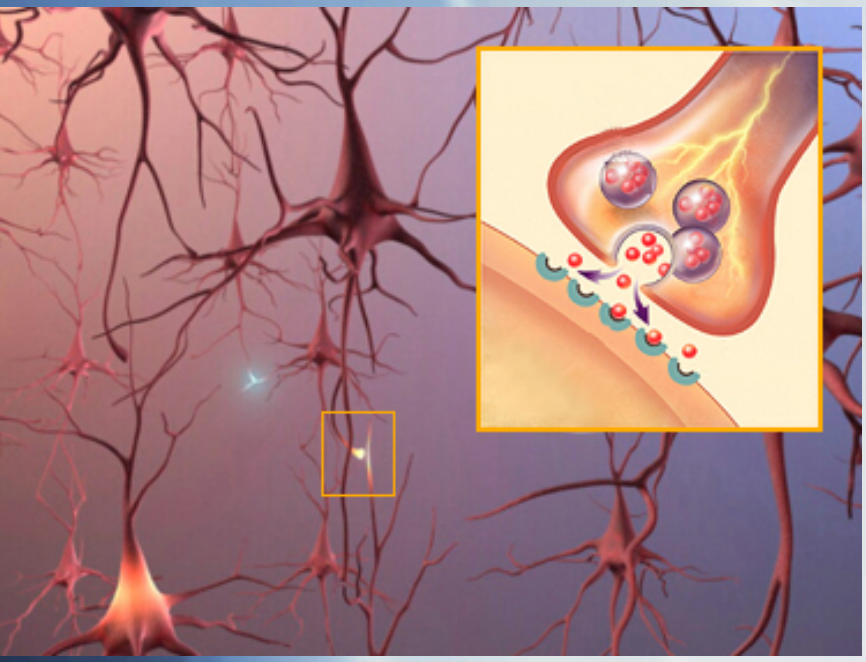
Oral lichenoid lesions

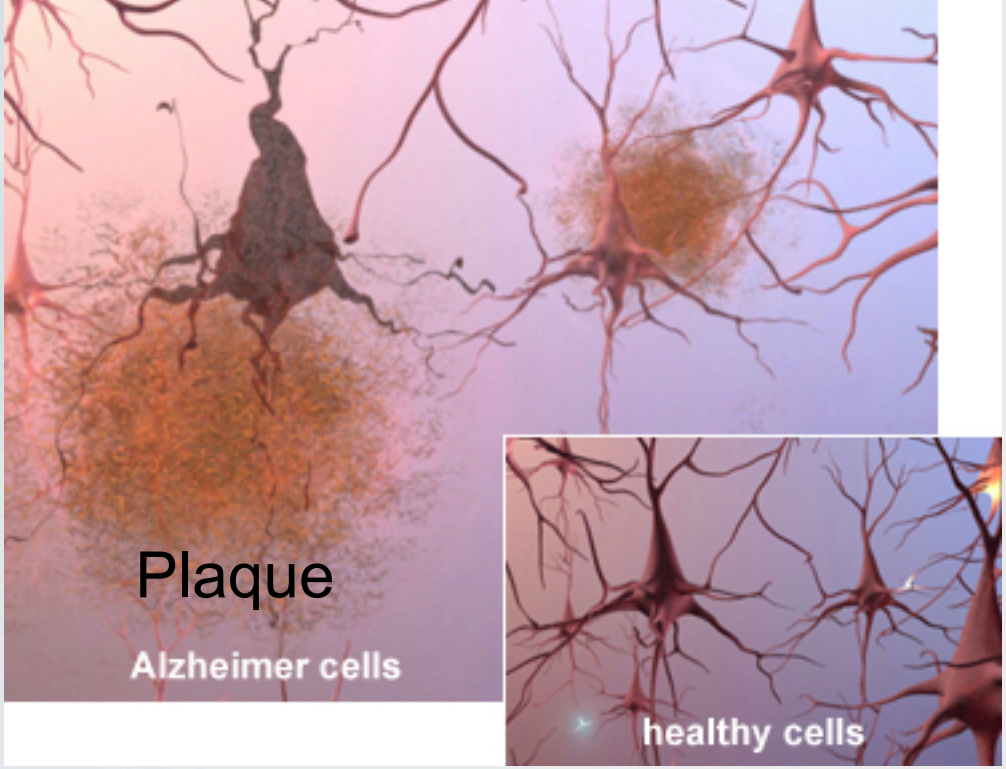
Dunsche A, Kästel I, Terheyden H, Springer IN, Christophers E, Brasch J (January 2003). "Oral lichenoid reactions associated with amalgam: improvement after amalgam removal". The British Journal of Dermatology 148 (1): 70–6.

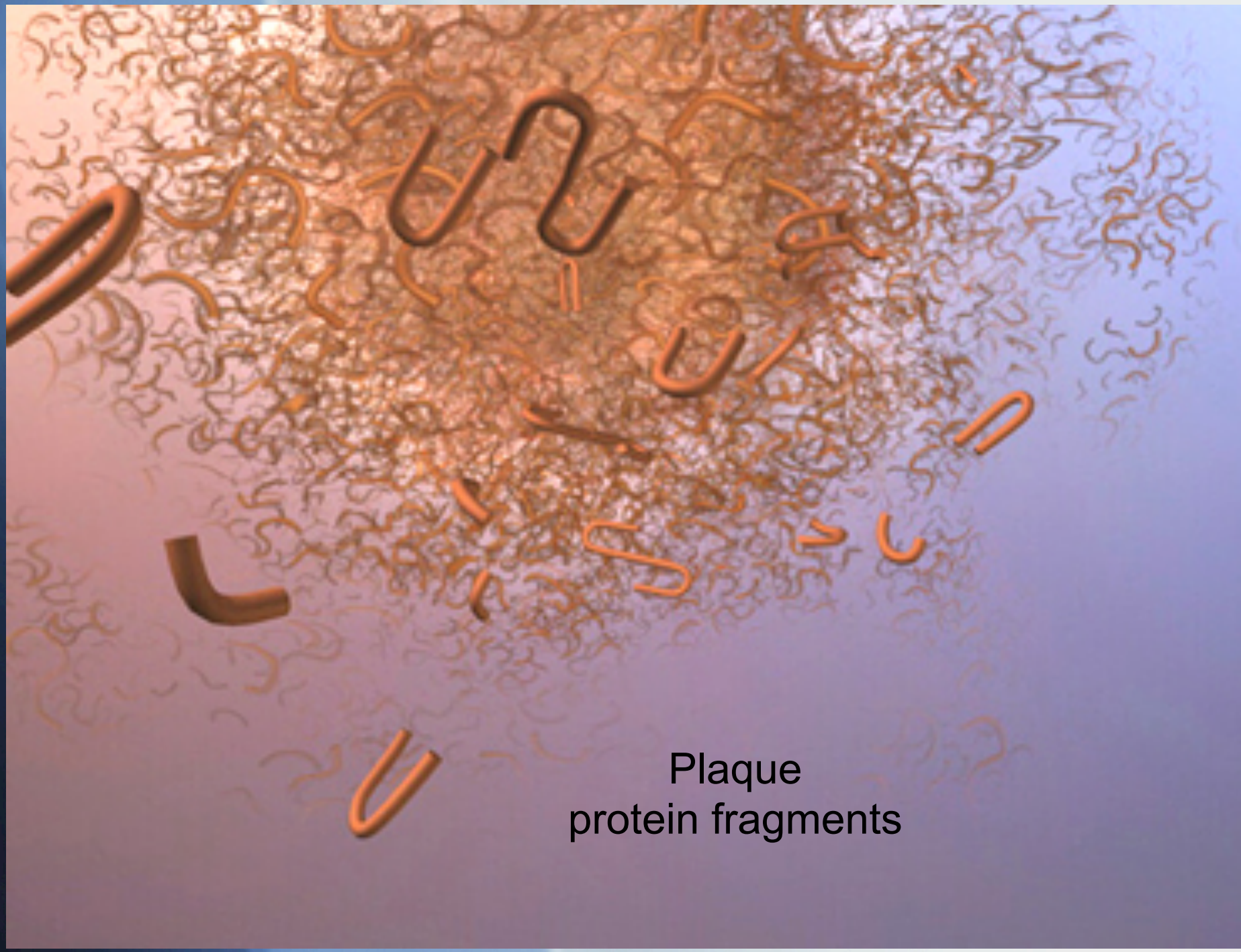
Alzheimer's

- Alzheimer's disease was discovered in 1906, in America, where dentists used mercury-laden amalgams to fill cavities (dentists in Europe largely avoided them). Today, more than 5.3 million Americans now have Alzheimer's disease. It afflicts half of people over the age of 85 and 20 percent aged 75 to 84.

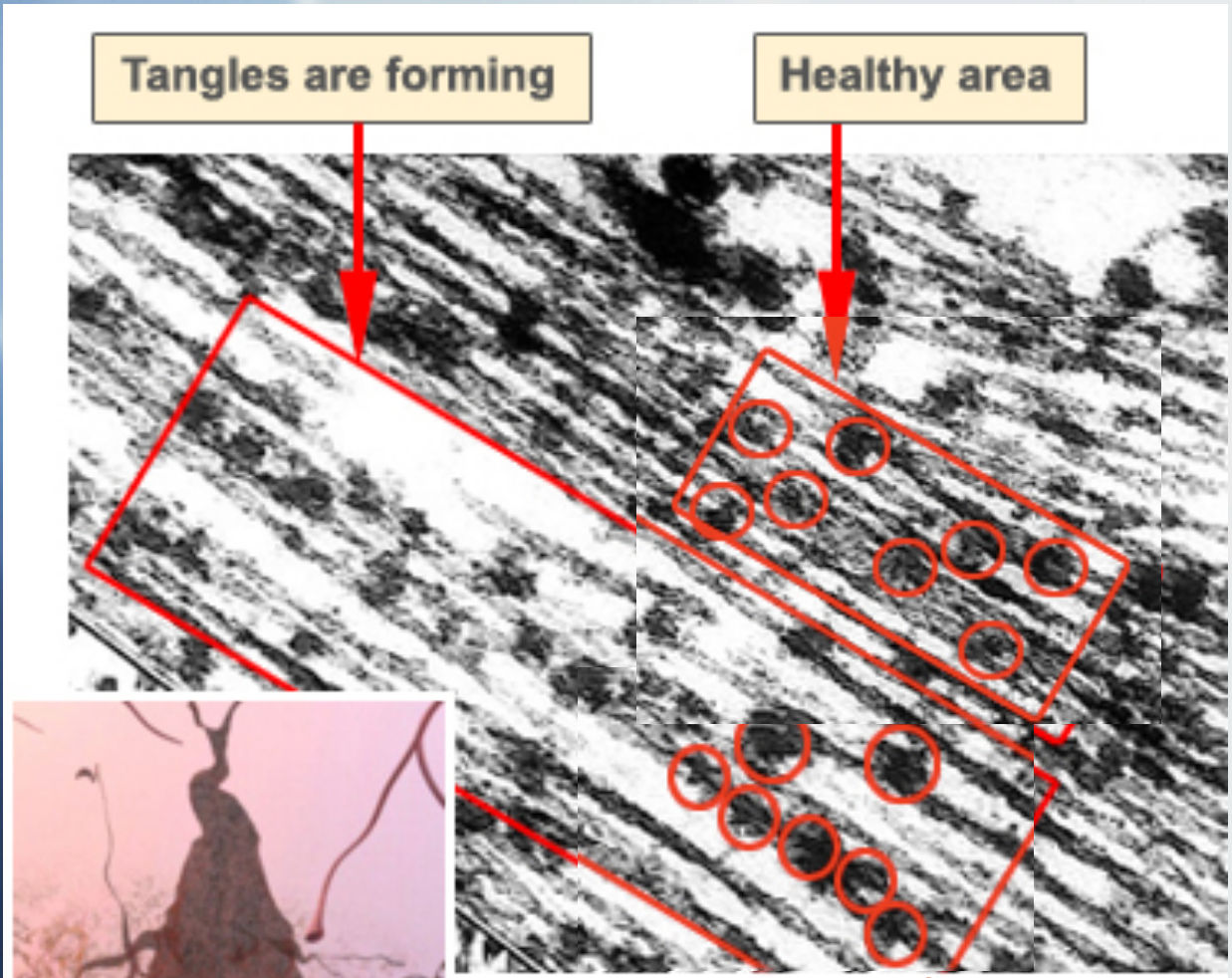

healthy
brain
advanced
alzheimer's




Plaque
Alzheimer cells
healthy cells


Plaque
protein fragments

Tangles amyloid protein

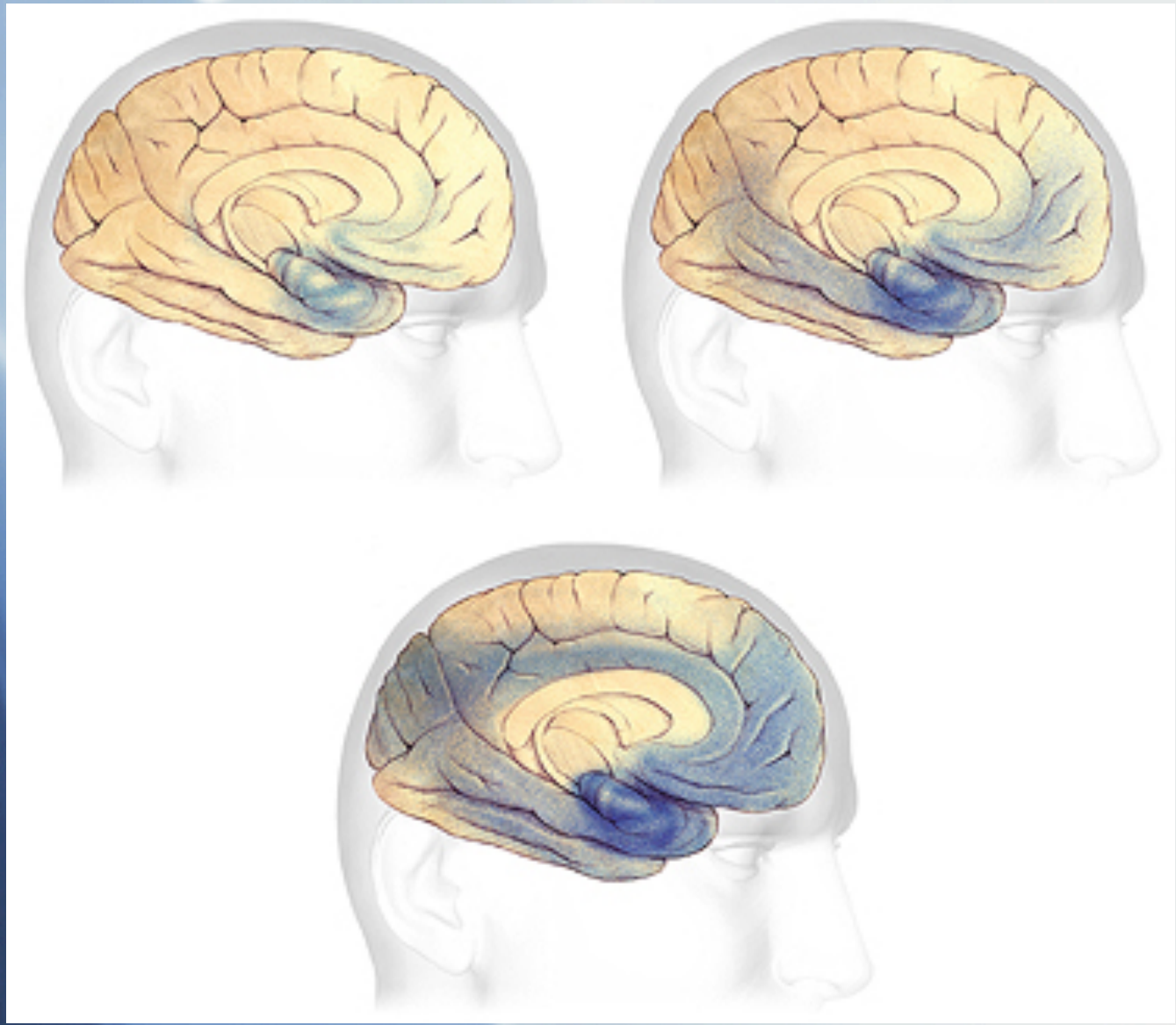


Olivieri, G., Brack, Ch., Muller-Spahn, F., Stahelin, H.B., Herrmann, M., Renard, P;, Brockhaus, M. and Hock, C. Mercury Induces Cell Cytotoxicity and Oxidative Stress and Increases ß-amyloid Secretion and Tau Phosphorylation in SHSY5Y Neuroblastoma Cells. J. Neurochemistry 74, 231-231, 2000.

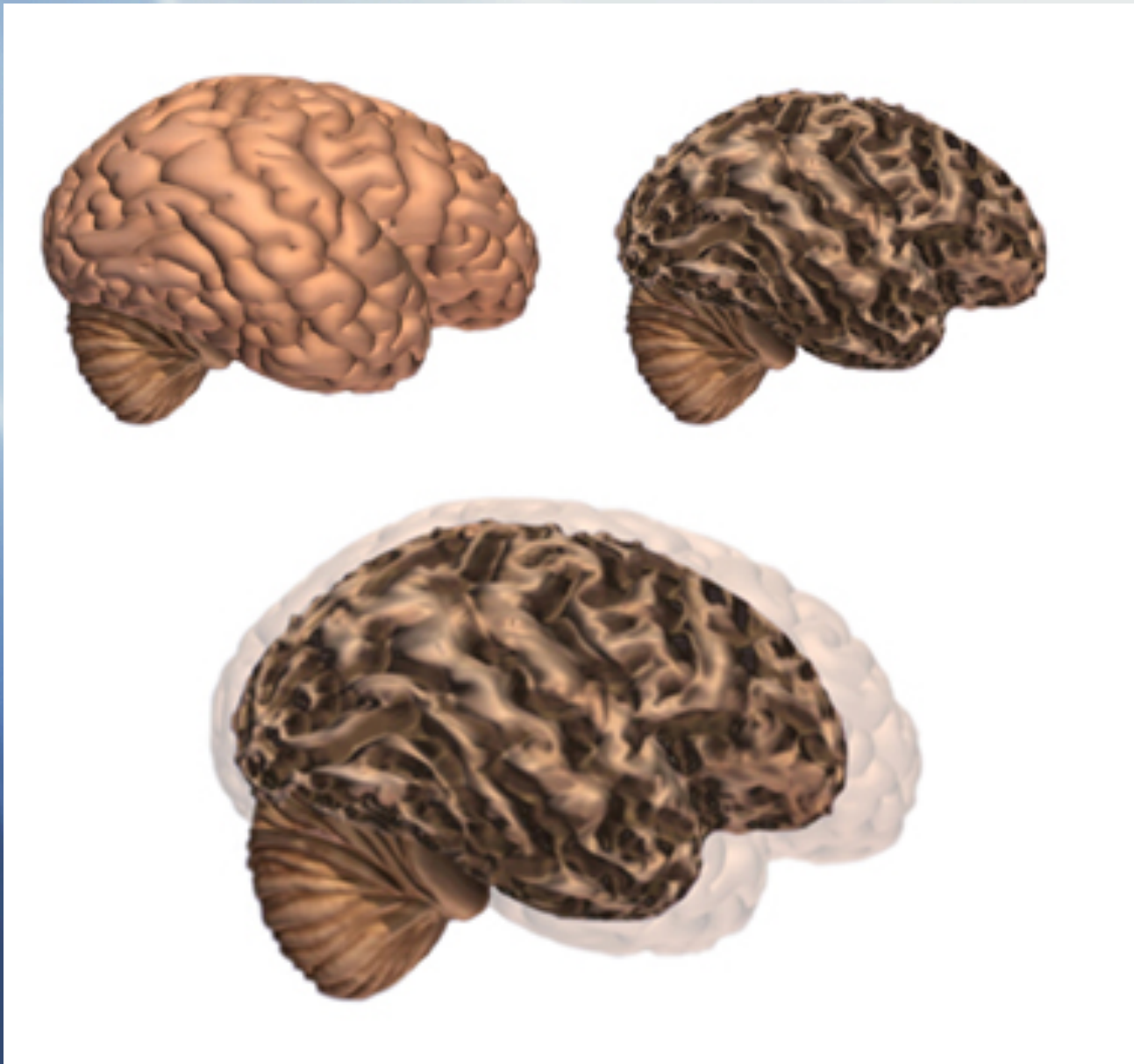
A protein called **tau** (rhymes with wow) helps the tracks stay straight.

In areas where tangles are forming:Tau collapses into twisted strands called tangles.The tracks can no longer stay straight. They fall apart and disintegrate Nutrients and other essential supplies can no longer move through the cells, which eventually die.

Progression of the disease



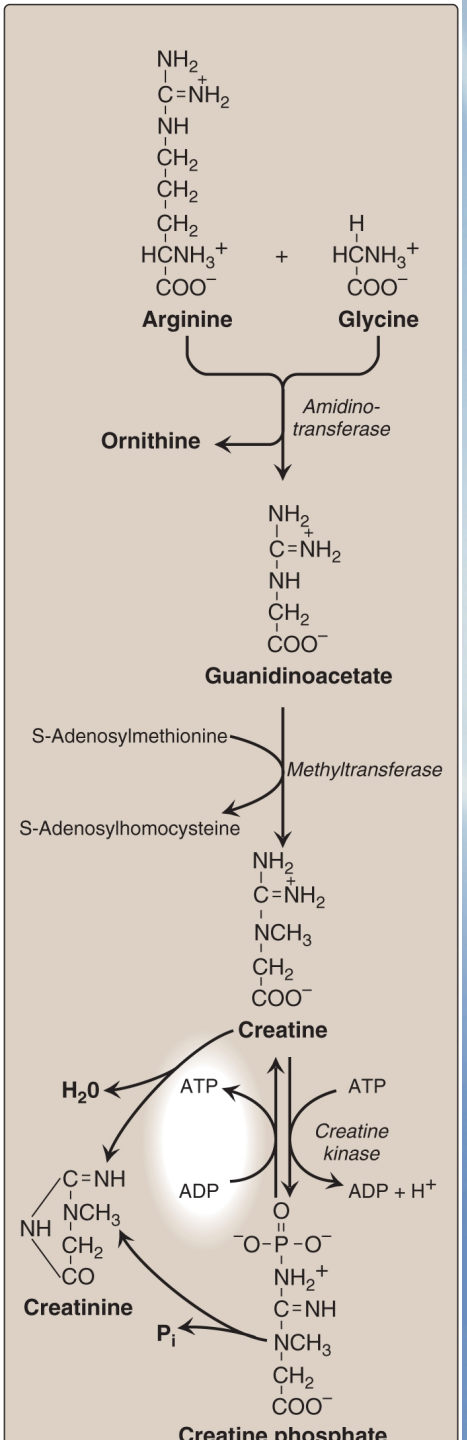
Alzeimer's change



Two very important brain nucleotide binding proteins, tubulin and creatine kinase (CK)

show greatly diminished nucleotide binding ability and they are abnormally partitioned into the membrane fraction of AD brain tissue

They have very reactive sulfhydryl in their active sites that, if modified, inhibits their biological activity


Arginine
Glycine
Amidino-transferase
Ornithine
Guanidinoacetate
S-Adenosylmethionine
Methyltransferase
S-Adenosylhomocysteine
Creatine
H20
ATP
ATP
Creatine kinase
ADP
ADP + H+
Creatinine
Pi
Creatine phosphate

- Hg^{2+} at 1-5 micromolar levels could selectively and totally abolish the binding activity of tubulin without any noticeable effect on other proteins.

- this definitely proves that chronic, daily exposure to mercury would exacerbate the clinical conditions of Alzheimer's disease by the ability of low doses of mercury to inhibit enzymes known to be inhibited in AD brain.

Alzheimer's

- Genetically programmed ability to rid the body of mercury. The brain has a house-cleaning protein that removes dangerous waste products, which comes in three varieties: APO-E2, APO-E3, and APO-E4. What is the basic structural difference between these three alleles? Simply, the protective APO-E2 has two sulfhydryls (cysteines) which can bind mercury or other heavy metals that APO-E4 lacks. For example, in APO-E3, one of these cysteine's is replaced by an arginine and in APO-E4, both of the cysteine are replaced by arginine. The APO-E2 can carry 2 atoms of mercury out of the brain; APO-3, one; and AOP-E4, none. The genes we acquire from each parent determine which two we have. People with two APO-E4 proteins (and thus no APO-E2 or -E3) have an 80 percent chance of acquiring Alzheimer's disease. And according to one study, autistic children have a huge preponderance of APO-E4 protein in their brains. So exposure in genetically sensitive people increases the risk of AD development. Exacerbation of this can also occur due to daily and lifetime of natural, industrial and domestic exposure to metals.

Amalgam removal Improvements

There are reports that show that removal of dental amalgam can leads to permanent improvement of various chronic complaints in a relevant number of patients during various trials.

- Mutter J, Naumann J, Walach H, Daschner F (March 2005). "Amalgam: Eine Risikobewertung unter Berücksichtigung der neuen Literatur bis 2005 [Amalgam risk assessment with coverage of references up to 2005]" (in German). Gesundheitswesen 67 (3): 204–16.

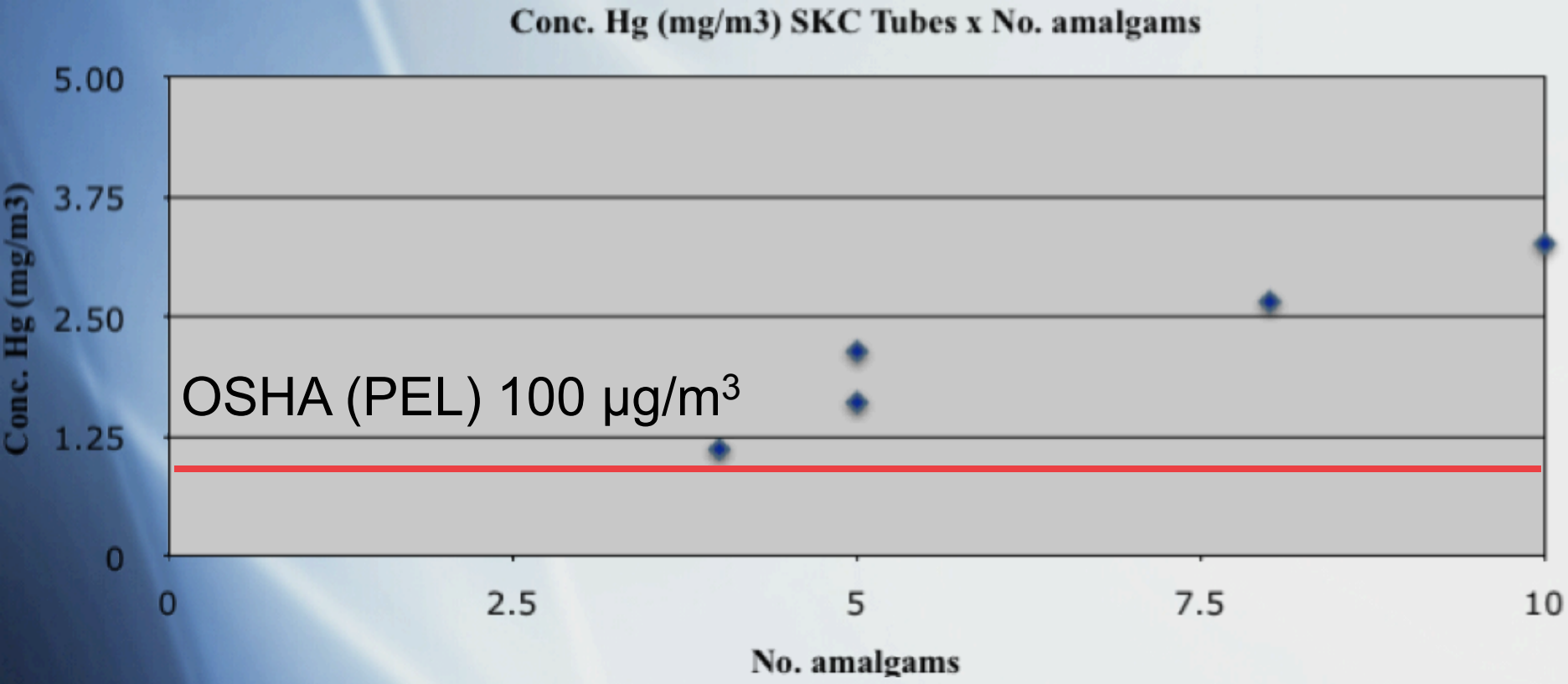
Other Environmental Effects

Hg Environmental Pollution

- The WHO reports that mercury from amalgam and laboratory devices accounts for 53% of total mercury emissions, and that one-third (30 %) of the mercury in the sewage system originates from dental amalgam flushed down the drain and dental clinical laboratories

Environmental Impact

- Amalgam removed from teeth is classified as toxic waste in various countries, but in many countries it is not regulated, including the United States



10-32 fold higher than OSHA PEL of 100 µg/m^3

This is in agreement with our results obtained from the mobile source which indicate an average exposure of 2.1 mg/m^3. Again this represents a 21 fold increase in the established OSHA standard. Other studies have shown that mixing amalgam exposes the operator to well over 1,000 ug/m^3 (David Kennedy, 2004)

How many bacteria we have in our mouth?

- It has been estimated that the average human mouth has over 400 species of bacteria, their combined populations total to billions and billions of distinctive organisms, (Stevens J. It's a jungle in there. BioScience, 1996:46:1-5).

Bacteria in mouth

- Since the mouth serves as an important portal of entry into the body, it also provides access to a wide variety of both aerobic (need oxygen to live) and anaerobic (live in the absence of oxygen) microbes. Saliva may contain up to 1,000,000,000 bacteria per milliliter.
- The types of microbes found in the oral cavity include: streptococci, staphylococci, corynebacteria, neisseria, lactobacilli, candida, and many others.

Acidic saliva

- Streptococcus mutans is an important colonizer on the surface of teeth, especially in people that eat a high sucrose (sugar) diet. These bacteria will break down the sugar and produce substances that help them stick to the tooth surface. When this sugar is broken down, a lot of lactic acid is produced. The production of lactic acid lowers the pH (increases the level of acidity) in the mouth, which will aid in the growth of lactobacilli.

Anaerobic bacteria

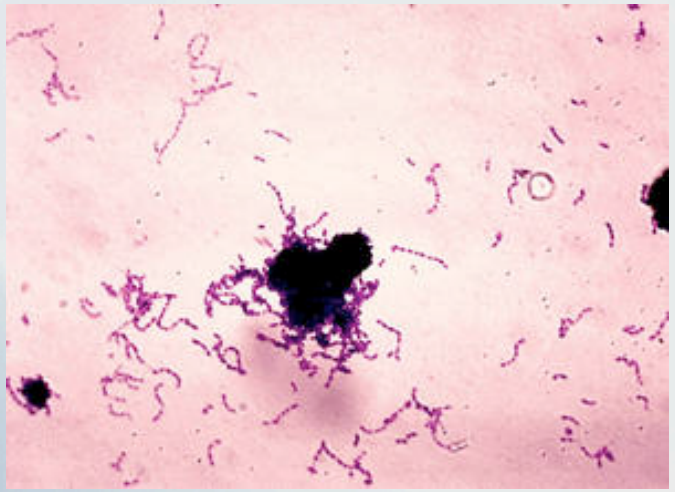
- The crevices between the teeth and gums, a large number of anaerobic microbes can be found. These crevices are microenvironments with low levels or an absence of oxygen, thus favoring these anaerobic microbes.

- Many bacteria live on the tongue including those that cause bad breath. Halitosis
- bacterial metabolism on the rear surface of the tongue.

Bacteria and disease

- If you look at dental caries, dental caries is loss of the enamel on the tooth surface. That is caused by bacteria which are very good at producing acids, particularly Streptococcus mutans and a few helper bacteria.

- Periodontal disease and gingivitis, gingivitis is the swelling and bleeding of the gums, there are specific bacteria associated with that and the associated, more severe form of the disease known as periodontal disease.



Methymercury in oral cavity

- The capacity of the oral bacteria Streptococcus mitior, S. mutans and S. sanguis to methylate mercury was investigated in vitro. Mercuric chloride and pulverized dental amalgam in distilled water, respectively, were used as sources of mercury. Methylmercury was found in the bacterial cells of all three tested strains. The results indicate that organic mercury compounds may be formed in the oral cavity.

- Methylation of mercury from dental amalgam and mercuric chloride by oral streptococci in vitro European Journal of Oral Sciences 2007 Volume 91 Issue 2, Pages 150 – 152.
- Heintze U, Edwardsson S, Derand T, Birkhed D. Methylation of mercury from dental amalgam and mercuric chloride by oral streptococci in vitro. Scand J Dent Res. 1983;91:150–152

- The anaerobic bacteria of periodontal disease produce hydrogen sulfide (H_2S) and methyl thiol (CH_3SH) from cysteine and methionine, respectively. This accounts for the "bad breath" many individuals have. However, in a mouth that produces H_2S, CH_3SH (from periodontal disease) and Hg^o (from amalgam fillings) the very likely production of their reaction products, HgS (mercury sulfide), CH_3S-Hg-Cl (methyl thiol mercury chloride) and CH_3S-Hg-S-CH_3 (Dimethylthiol mercury) has to occur. This is simple, un-refutable chemistry whose presence is supported by easily observable amalgam tattoos. These tattoos are purple gum tissue surrounding certain teeth where the gum and tooth meet and caused by HgS as determined by mercury analysis of such tissue. HgS is one of the most stable forms of mercury. compounds and is the mineral form of mercury, called cinnabar, from which mercury is mined from the earth). All of these compounds are classified as extremely toxic and the latter compound, dimethylthiol mercury is very hydrophobic and it solubility similar to dimethyl mercury.

First Report

- In three samples of restorations associated with dental amalgam. We believe this to be the first finding of methyl mercury in the human mouth. Although the amounts found are small (4.0, 5.3 and 37.3 ng per sample), any measurable amount of methyl mercury contributes to the total body's burden of mercury.

- WILLIAM A. SELLARS MD, RODNEY SELLARS JR DDS, LIAN LIANG PHD AND JACK D. HEFLEY PHD Journal of Nutritional & Environmental Medicine (1996)6,33-36

Paper in 2001

- The amount of organic and inorganic mercury in whole saliva was measured in 187 adult study subjects. The mercury contents were determined by cold-vapor atomic absorption spectrometry. The amount of organic and inorganic mercury in paraffin-stimulated saliva was significantly higher ($p<0.001$) in subjects with dental amalgam fillings ($n = 88$) compared to the nonamalgam study groups ($n = 43$ and $n = 56$): log(e) (organic mercury) was linearly related to log(e) (inorganic mercury, $r(2) = 0.52$). Reported that the levels of methyl-mercury in saliva ranged from 0 to 174 nmol/L (0–37.523–µg/L), with a mean methylmercury level estimate of 14.0 nmol/L (3.019–µg/L).

§ Leistevuo J, Leistevuo T, Helenius H, Pyy L, Osterblad M, Huovinen P, et al. Dental amalgam fillings and the amount of organic mercury in human saliva. Caries Res. 2001;35:163–166.

Hg levels in Saliva

- Inductively coupled plasma-mass spectrometry was used to measure a wide range of possible values of total mercury in saliva obtained from approximately in 270 individuals with amalgams, Mercury levels ranged from the limit of detection [LOD; 0.1 μg/L] to 780 μg/L in both salivary baseline flow rate in unstimulated condition and in a post–chewing-gum test

- Guzzi G, Minoia C, Pigatto PD, Lucchiari S, Severi G. Mercury and dental patients: toxicology, immunology and genetic connection Toxicol Lett. 2005;158S:S239

Is organic Hg enough?

- Assuming that daily adult salivary secretion is at least 800 mL, speciation analyses indicate that exposure to methyl-mercury through ingestion—apparently derived from oral bacteria biomethylation of inorganic mercury—is about 2–3 µg/day. (.05 ug/kg)

- Currently, U.S. EPA uses a RfD of 0.1 µg/kg body weight/day as an exposure without recognized adverse effects.

Risk is it real? PR

- it is estimated that more than 300,000 newborns each year may have increased risk of learning disabilities associated with in utero exposure to methylmercury.

- **Mercury, Lead, and Zinc in Baby Teeth of Children with Autism Versus Controls**
- **Children with autism had significantly (2.1-fold) higher levels of mercury but similar levels of lead and similar levels of zinc.**
- *Journal of Toxicology and Environmental Health, Part A*, 70: 1046–1051, 2007

- Some dentists, (including a member of the FDA's Dental Products Panel) suggest that there is an obligation to inform patients that amalgam contains mercury.

- **Effect of teeth amalgam on mercury levels in the colostrums human milk in Lenjan**
- The mean mercury concentrations in milk of mothers without teeth fillings (n = 13), with one to three teeth fillings (n = 10), and four to eight teeth fillings (n = 15) were 2.87, 5.47, and 13.33 µg/l, respectively. The result of this study also showed a positive correlation of mercury milk levels with the number of teeth fillings of the mother ($p < 0.05$, $r = 0.755$).

- Environmental Monitoring and Assessment
- Volume 184, Number 1 (2012), 375-380, DOI: 10.1007/s10661-011-1974-1

Summary

The **tolerable daily exposure level for mercury** developed in a report for Health Canada is .014 micrograms/ kilogram body weight(ug/kg) or approximately 1 ug/day for average adult(2) **(.04 ug/day for a 6.5 pound infant** or **.14 ug/day for a 22 pound infant**).

The U.S. EPA Health Standard for elemental mercury exposure(vapor) is 0.3 micrograms per cubic meter of air (1).

The U.S. ATSDR health standard(MRL) for mercury vapor is 0.2 ug/ M3 of air, and the MRL for methyl mercury is 0.3 ug/kg body weight/day(4).

For the average adult breathing 20 M3 of air per day, this amounts to an exposure of 4 or 6 ug/day for the 2 elemental mercury standards. For an **infant** breathing 4 M3 of air per day, this would be **0.8 to 1.2 ug/day** and for a child breathing 8 M3 per day of air this would be 1.6 to 2.4 ug/day.

COUNTERTHINK

"SEAFOOD MERCURY WARNING"