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The Fifth Congress of the Paris Appeal  
May 18th 2015  
Royal Academy Of Medicine, Belgium

**Increased Mercury Release from Dental Amalgam Restorations after Exposure to Electromagnetic Fields as a Potential Hazard for Hypersensitive People and Pregnant Women**

**SMJ Mortazavi, Ph.D**  
Professor of Medical Physics & INIRPRC Director  
Shiraz University of Medical Sciences  
mmortazavi@sums.ac.ir

**Ghazal Mortazavi, Ph.D**  
Dentist  
Bushehr University of Medical Sciences  
ghz.mortazavi@gmail.com

Ghazal Mortazavi (DDs) and SMJ Mortazavi (Ph.D)

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**Environmental idiopathic intolerance:  
What role for EMFs and multiple  
chemicals ?**


**Electrohypersensitivity (EHS) and multiple  
chemical sensitivity (MCS)**

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- Electricity is an essential part of modern life.
- It is estimated that by the middle of this century, the global use of electricity will be multiplied by a factor of 2.5 to 3.0.

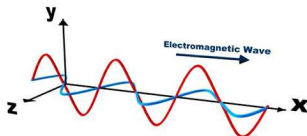


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- Electromagnetic fields (EMF) are produced by the motion of electrons.
- All electrical or electronic devices such as wireless technologies (e.g. Wi-Fi, mobile phones and cordless phones), laptop computers, microwave ovens and power lines produce electromagnetic fields.






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**EMF Ocean!**  
We all live in an ocean of electromagnetic fields!

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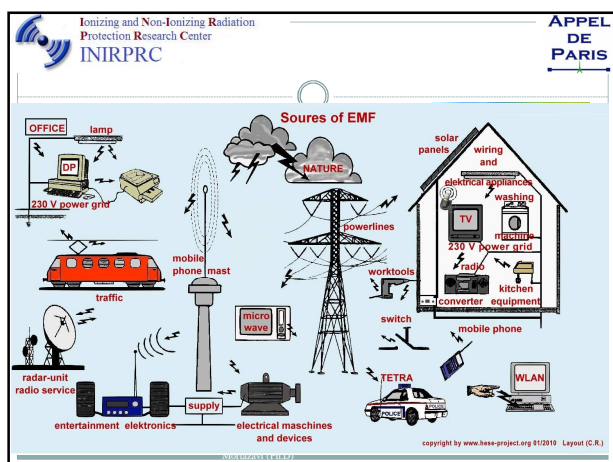
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 **World Health Organization**

*"Everyone is exposed to a complex mix of weak electric and magnetic fields, both at home and at work, from the generation and transmission of electricity, domestic appliances and industrial equipment, to telecommunications and broadcasting."*

- World Health Organization

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**A very basic question that should be answered:**

**Why is Exposure to Different Sources of EMFs so Important?**

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- Very Frequent Use by the **Whole Population**
- Wide **Geographical** Distribution of Users
  - In Africa, No land-line but mobile phones are used
- **Poor Knowledge** about the Effects
- Inescapable Exposures
- Very Wide Sources
  - Baby Watch, Wireless Technologies
- Hidden Sources
  - Wi-Fi Signals coming from our neighbours
- Continuous 24 h/d, 7 days/wk exposures
- Old Standards
- Challenging Serious Biological Effects
- The issue of exposure to Children

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**Current Controversies**

- The effect of RF-EMF on biological systems is still controversial.

RF - Radio Frequency Radiation - Microwave Radiation

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**Amalgam Mercury Issue**

- It was previously believed that dental amalgam, which contains about fifty percents mercury, is **inert** and **cannot release** mercury after restoration.
- However, in **2009**, the **US FDA** acknowledged that dental amalgam releases low levels of elemental mercury vapor.

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**Dental Amalgam Safety Concern**

- Since 150 years ago, amalgam has been used in dentistry as an excellent and versatile dental restorative material due to its properties such as **low cost, ease of application, strength, durability, and bacteriostatic effects.**
- However, nowadays, the popularity of amalgam is decreasing due to rapidly growing concerns about its detrimental health effects, environmental pollution, and aesthetics.

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## Now there is a growing public concern!



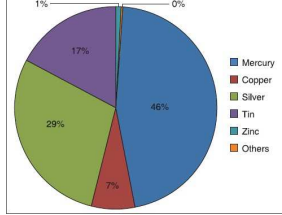
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## Historical Changes of Mercury%

- After some historical changes in the mercury-to-amalgam ratio, modern amalgams are now produced from precapsulated alloy consisting of **42-45%** mercury by weight.



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## ADA American Dental Association®

America's leading advocate for oral health

According to ADA:  
"Sometimes described as "silver-colored" fillings, dental amalgam has been used by dentists for more than **100 years!**"

"Because of their **durability**, these silver-colored fillings are often the **best choice** for large cavities or those that occur in the back teeth where a lot of force is needed to chew."

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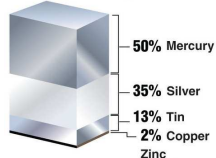
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## More mercury than silver

Amalgam, the silver alloy used to fill cavities, is 50 percent mercury. While the majority of dentists now use mercury-free composite fillings, many are concerned about possible mercury toxicity.

**Composition of amalgam fillings**



**Amount of mercury in ...**

- Average amalgam filling: **0.5 grams**
- Mercury thermometer: **0.5 grams**
- Fluorescent light: **0.04 grams**

The average American adult has **8 fillings**

Source: American Dental Association, World Health Organization  
Graphic: Chicago Tribune © 2009 MCT


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## Are low levels of mercury safe?

- Recent findings indicate that mercury, even at low doses, may cause toxicity
- As dental amalgam fillings release low levels of elemental mercury vapor, today, there is a **debate** over :
  - If these levels are safe and
  - Whether the safety threshold is the same for different subpopulations.




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## The rationale for our previous studies

- Concerns regarding the **rapidly growing exposure to EMF sources** and **increased mercury release** from dental amalgam after exposure to electromagnetic fields, especially in children, people who are routinely exposed to electromagnetic fields and hypersensitive subpopulations, prompted us to perform more studies.



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## MRI and the Release of Mercury

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**Mercury Release from Dental Amalgam Restorations after Magnetic Resonance Imaging and Following Mobile Phone Use**

<sup>1</sup>S.M.J. Mortazavi, B. Dine, A. Tazak, K. Khoshdel, A. Karvouni, R. Vazirnejad, B. Rahmizadeh, M. Ghossein and M. Bakhshi-Mohtai

<sup>1</sup>Department of Medical Physics, School of Paramedical Sciences, Shiraz University of Medical Sciences, Shiraz, Iran  
<sup>2</sup>Department of Medical Physics, School of Dentistry, Rafsanjani University of Medical Sciences, Rafsanjan, Iran  
<sup>3</sup>School of Dentistry, Rafsanjani University of Medical Sciences, Rafsanjan, Iran  
<sup>4</sup>Department of Dental Radiology, Chaharmahal School, Rafsanjan University of Medical Sciences, Rafsanjan, Iran  
<sup>5</sup>Department of Community Medicine, School of Medicine, Rafsanjan University of Medical Sciences, Rafsanjan, Iran  
<sup>6</sup>Department of Radiologic Technology, School of Paramedical Sciences, Rafsanjan University of Medical Sciences, Rafsanjan, Iran  
<sup>7</sup>Toxicology Laboratory, Imam Khomeini Hospital, Mashhad University of Medical Sciences, Mashhad, Iran  
<sup>8</sup>Department of Medical Toxicology, Medical Toxicology Research Center, Imam Khomeini Hospital, Mashhad University of Medical Sciences, Mashhad, Iran

**Abstract:** In the 1st phase of this study, thirty patients were investigated. Five milliliters standard saliva was collected just before and after MRI. The magnetic flux density was 1.5 T and the duration of exposure of patients to magnetic field was 30 minutes. In the 2nd phase, fourteen healthy University students who had not used mobile phones before the study and did not have any previous amalgam restorations were investigated. Dental amalgam restoration was performed for all 14 students. Their urine samples were collected before amalgam restoration and at days 1, 2, 3 and 4 after restoration. The measured urinary Hg concentrations of the patients before and after MRI were 8.6±3.1 and 11.3±5.3 µg L<sup>-1</sup>, respectively (p<0.01). A statistical significant (p<0.05) higher concentration was observed in the students used mobile phones. The measured urinary Hg concentrations of the students who used mobile phones were 2.43±0.25, 2.71±0.27, 3.79±0.25, 4.80±0.25, 4.50±0.25 µg L<sup>-1</sup>, respectively.

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## MRI & Release of Mercury

Fig. 1: Mercury saliva concentrations of the studied participants before and after MRI

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## Mobile Phone Use and the Release of Mercury

Table 2: The (mean±SE) urinary Hg concentrations of students with (test group) and without using mobile phone (controls) after dental amalgam restoration

Urine Hg (mcg L <sup>-1</sup> )	Time					p-value (ANOVA)
	Day 0	Day 1	Day 2	Day 3	Day 4	
Controls	2.07±0.58	2.34±0.80	2.51±0.67	2.66±0.64	2.76±0.84	NS
Test group	2.43±0.66	2.71±0.72	3.79±0.65	4.80±0.71	4.50±0.85	p<0.001
p-value (Student's t-test)	NS	NS	p<0.001	p<0.001	p<0.001	

Mercury level (µg L<sup>-1</sup>), NS: Non Significant

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## Rationale for Our Recent Study

- Nowadays, MRI systems utilize:
  - Stronger static magnetic fields
  - Faster and stronger gradient magnetic fields
  - More powerful radiofrequency (RF) transmission coils

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## Methods in our recent study

- To overcome the limitations of our previous study, we have recently studied the effects of stronger magnetic fields (1.5 T in our recent study vs. 0.25 T in our previous report) and provided further support for the adverse effect of MRI in increasing the release of mercury from dental amalgam fillings.

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## Results

Figure 1: Trend of urinary mercury concentration in the MRI exposed and unexposed group. Error bars represent SD.

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