

# Current Research

Applied Aquatic Chemistry:

Corrosion/Coagulation/Treatment

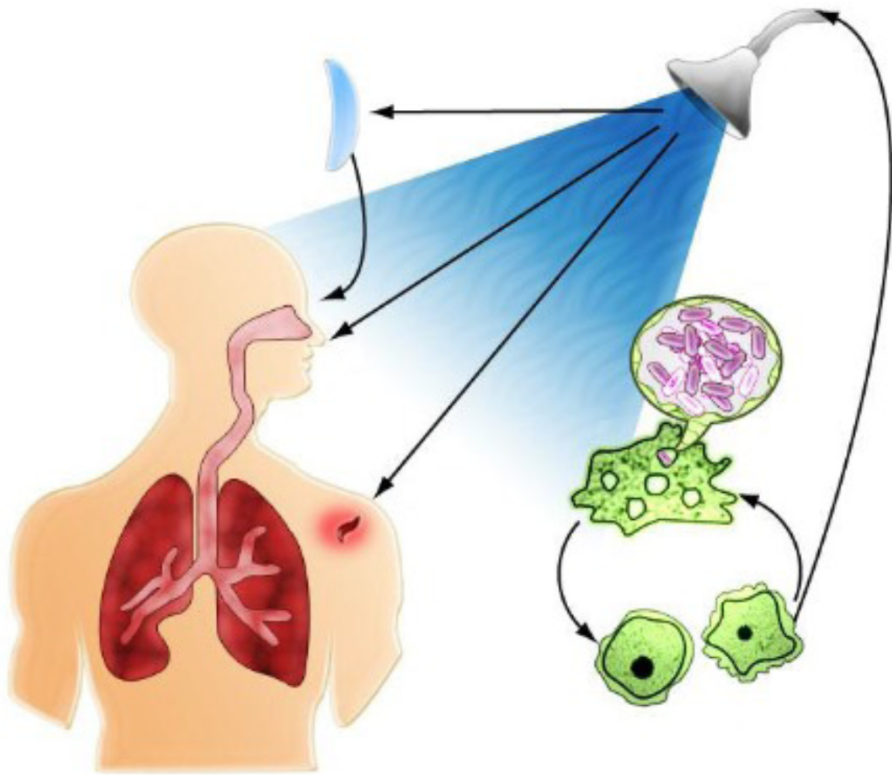
Applied Biology:

Nitrification and Human  
Pathogens in Homes

Corrosion

# 1) Pathogens in Premise Plumbing (partnership with Dr. Pruden)

- William/Pan Ji/Caitlin / Dr. Hong Wang /Sheldon  
(NSF1/Sloan/WaterRF/NSF2)



- *What factors cause amplification of Legionella pneumophila, Mycobacterium avium, Acanthamoeba in building plumbing systems?*
- *How do we control these dangerous organisms?*

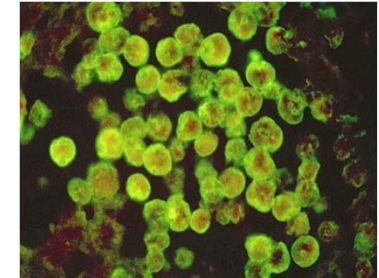
**Project 4379:**  
*Research Needs for Opportunistic  
Pathogens in Premise Plumbing:  
Experimental Methodology,  
Microbial Ecology and Epidemiology*

Overview of Project, Drivers for Research and Outcomes

Marc Edwards, Amy Pruden (PI), Joe Falkingham

# Opportunistic Pathogens

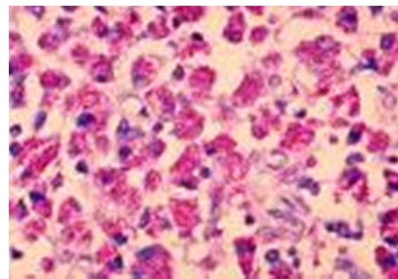
- ③ Opportunistic pathogens in premise plumbing are now the primary source of water-borne infectious disease in developed countries
  - ③ Per year: Up to **18,000 Legionnaire's** and **30,000 MAC** cases
- ③ not fecal-associated
- ③ Immunocompromised people particularly at risk
- ③ Regulatory challenge- who's responsibility?



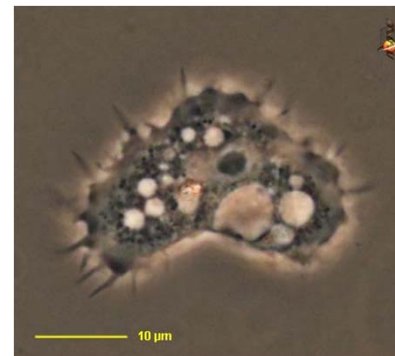
*N. fowleri*



*L. pneumophila*



*Mycobacterium avium*  
complex (MAC)



*Acanthamoeba*



*P. aeruginosa*

# Practical Drivers and Opportunities

- Increased reporting/detection
- Increased susceptible populations
- Main water distribution system upgrades
- Premise plumbing upgrades
- Green building/green devices
- Energy sustainability links

*These are all coming one way or another...*

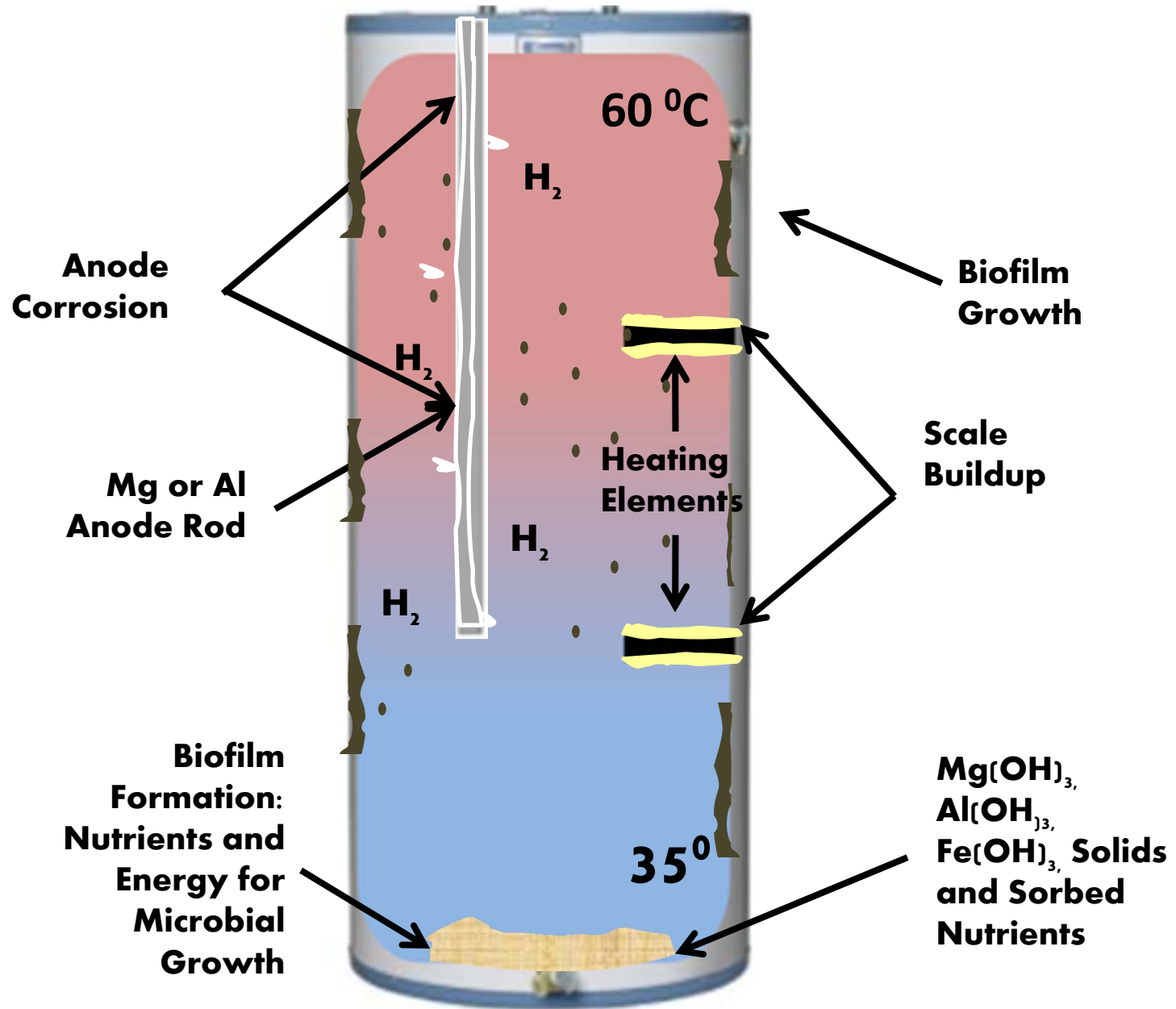


## **Microbial Ecology of Residential Hot Water Heater Systems:**

**Role of Hot Water System Type/Design on Factors  
Influential to Pathogen Re-growth: Temperature,  
Chlorine Residual, Hydrogen Evolution and Sediment**

Randi Brazeau, Amy Pruden and Marc Edwards  
October 4, 2013

# Electric Water Heater



## 2) How Green are Green Buildings?



*Exposé: In U.S. building industry, is it too easy to be green? 10/24/2012*

William and Ben, WaterRF

We have documented the following problems:

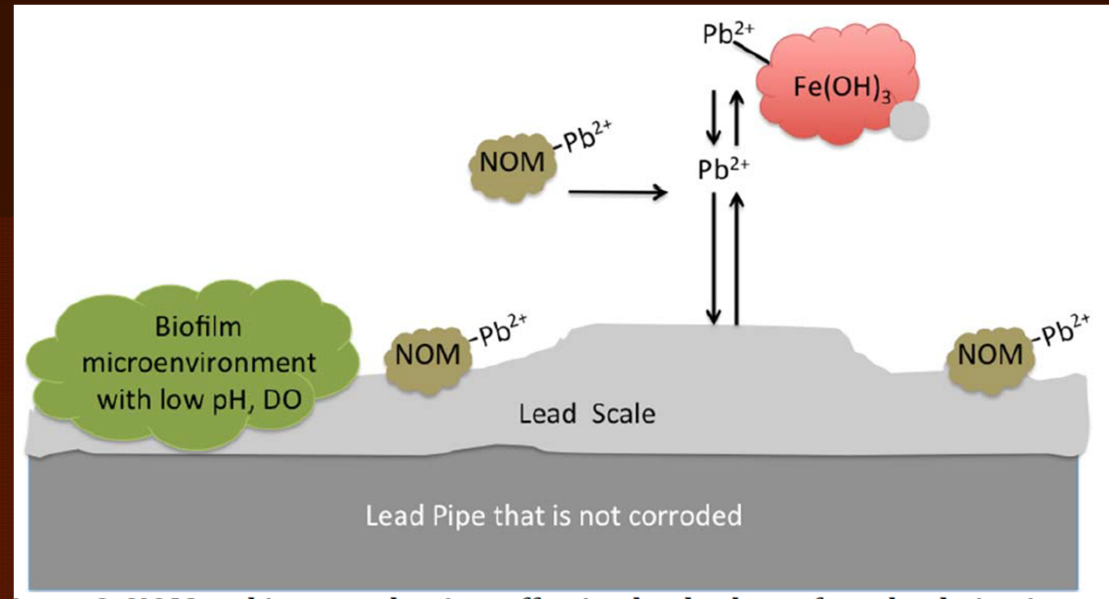
- 1) Green Hot Water Systems can use > 200% more energy than conventional systems (Hot water: by far the largest water related energy demand)
- 2) Greater likelihood of pathogens in some green systems (Legionella = #1 source of waterborne disease/deaths)
- 3) Potable water in green buildings can taste/smell bad, have higher lead





# 3. Getting the Lead (and Copper) Out

- Brandi Clark
- Sheldon Masters
- Kelsey Pieper



Rust from Iron Pipes Triggered Increased Lead from Pipes in Providence



# Water in D.C. Exceeds EPA Lead Limit

Random Tests Last Summer Found High Levels in 4,000 Homes Throughout City

By David Nakamura Washington Post Staff Writer

Saturday, January 31, 2004; Page A01

Congressional report prompts fear  
and anger over lead in D.C. water

By Carol D. Leonnig Washington Post Staff Writer  
Friday, May 21, 2010

Agencies Brushed Off Lead Warnings

By Carol Leonnig and D'Vera Cohn Washington Post Staff Writers  
Sunday, February 29, 2004; Page A01

An Immeasurable Threat in D.C.

High Lead Levels Hurt Developing Children, But Scientists Say Danger Is Hard to Gauge  
By Avram Goldstein Washington Post Staff Writer  
Friday, February 20, 2004; Page B01

CDC's botched handling of 2004 District  
lead scare reveals toxic bureaucracy

Robert McCartney Thursday, May 27, 2010

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**THE INCREASING USE OF LEAD AS AN  
ABORTIFACIENT ;**

A SERIES OF THIRTY CASES OF PLUMBISM.\*

BY ARTHUR HALL, M.A., M.D.CANTAB., F.R.C.P.,  
Professor of Pathology, University College, Sheffield; Physician,  
Sheffield Royal Hospital.

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\* Read before the Yorkshire Branch of the British Medical Association  
at Bradford, January, 1905.

NOV. 13, 1926]

[ THE BRITISH  
MEDICAL JOURNAL

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**LEAD AS AN ABORTIFACIENT.**

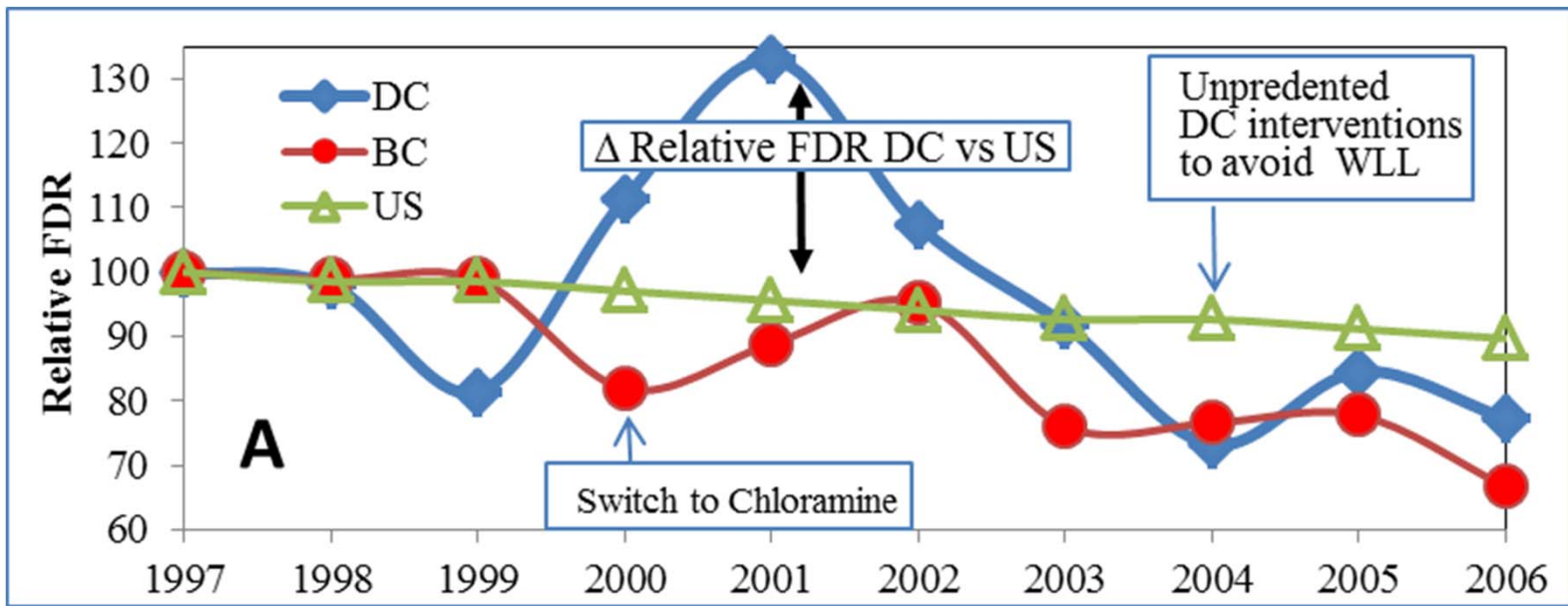
SIR,—Some time ago, in country practice, I had a message from a neighbour asking me to see with him a case of acute abdominal disease. The history was this: A robust young woman (married three months) had had pain in the stomach a few days previously, and again on the day before, when she was first seen. On inquiry her doctor was

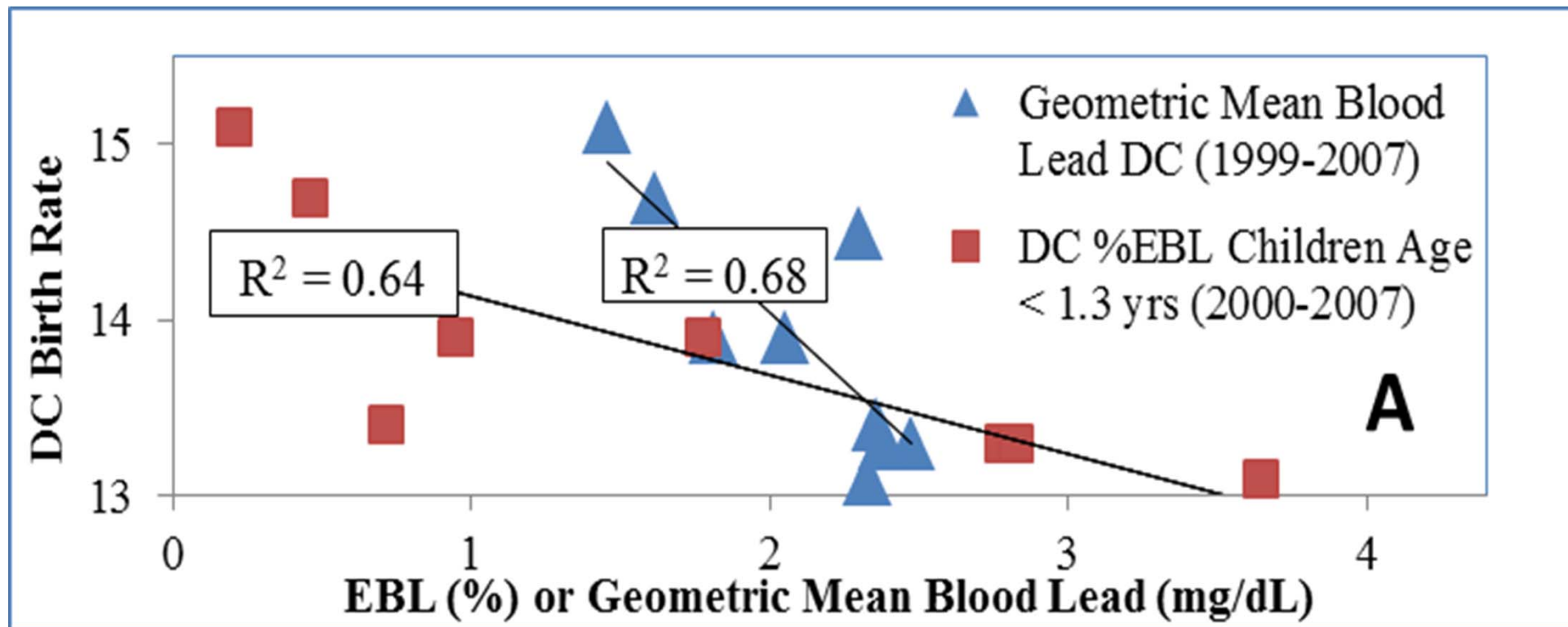
**Lead  
abortion  
pill dose  
exceeded  
in 15% of  
DC homes**



**Fetal Death and Reduced  
Birth Rates Associated  
with Exposure to Lead-  
Contaminated Drinking  
Water**

Period of high lead  
in water exposure





# Water Infrastructure

Biggest Environmental Engineering Problem

- 1 trillion dollars in next 30 years
- Public health and safety implications



FRIDAY, FEBRUARY 1, 2013

DONALD GILLILAND

THE PATRIOT-NEWS



A "super sinkhole" at Fourth and Woodbine Streets in Harrisburg, Pa., last month. There are around 41 such sinkholes in the city, but the local government is too broke to fix them.

# Chicago Tribune



QUESTIONS? CALL 1-800-TRIBUNE

WEDNESDAY, SEPTEMBER 25, 2013

BREAKING NEWS AT CHICAGOTRIBUNE.COM

*"We owe it to people to tell them that their water might not be safe to drink."* — Marc Edwards, professor of civil and environmental engineering at Virginia Tech University



CHRIS WALKER/TRIBUNE PHOTO

A pipe is guided into place Friday as new water mains are installed along Thorndale Avenue at Glenwood Avenue on the city's Far North Side. A study found such projects can interfere with protective coatings in older pipes and allow lead to leach into tap water.

## EPA: Pipe work may boost lead in water

### AFFORDABLE CARE ACT

## Illinois gets small break on prices for health plans

Residents to pay slightly less than national average, data show 1 week before rollout

BY PETER FROST  
Tribune reporter

Illinois residents will pay slightly less than the national average for health insurance offered under President Barack Obama's health care law, according to rates released Tuesday by state and federal officials.

The snapshot provides an early yet incomplete look at how much consumers might pay in premiums and comes a week before the launch of new insurance exchanges, the online marketplaces in which individuals, families and small businesses can compare and buy coverage, often with the help of federal tax credits.

While state and federal officials released broad details on how much those plans might cost in certain areas, they did not release exact figures for each of the 165 health plans being sold in Illinois, explaining that rates will not be final until Tuesday. They also did not reveal the specific copays and deductibles that most consumers will face when they see a doctor, visit an emergency room or undergo surgery.

Despite that missing information, the new data provide an important overview of the kind of options consumers will have. The report also demonstrates that many consumers will likely find an affordable option, though some may face higher premiums, as critics are quick to point out.

"We are seeing, across the board, fairly competitive prices," said Caroline Pearson, vice president of Avalere