Introduction

Dr. Jeffrey B. Nordella
Physician

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Introduction

- Jeffery B. Nordella, M.D.
- University of California San Diego – B.S. Human Biology
- University of California Los Angeles – M.D.
- A primary care physician/clinician for 33 years


ONLY
URGENT CARE
Shred-it
Making sure it's secure.
I will do
Toxin Testing
For Food

Largest Methane Blow Out in US History

- 100,000+ metric tons of methane gas
  - By volume, this amount is 220 times greater than the oil released during the 2010 Deepwater Horizon oil spill in the Gulf of Mexico.
- 16 weeks of uncontrollable release

Unprecedented Toxic Exposures:

- Quantity
- Combination
- Duration

Unprecedented Toxic Exposures:

- **Dumping numerous toxins into your sanctuary, your home … creating a nuisance and trespassing**

- **The ultimate trespass when the toxins affect you, your family and your pet's HEALTH**

What Does this All Mean to Your Health?

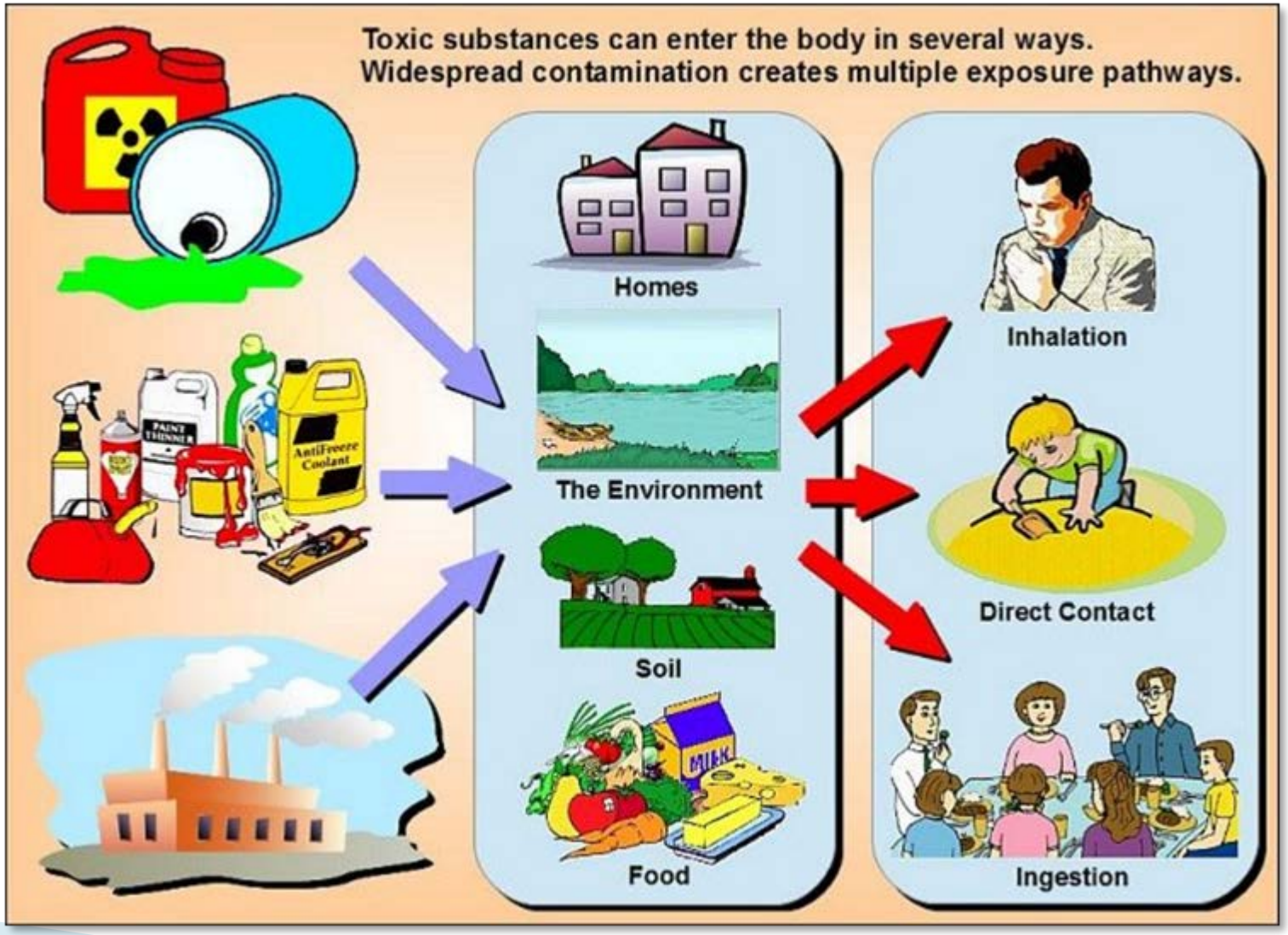
- Section 1: **Scientific Foundation**
- Section 2: **Clinical Health Probe & Toxicology Study**
- Section 3: **Findings**
- Section 4: **What has Been Done for the Community?**
- Section 5: **Water Testing**
- Section 6: **Conclusion**
- Section 7: **Q&A**

Scientific Foundation

Section 1

How Toxins Enter the Body

- Inhalation
- Absorption (skin)
- Ingestion



What Happens to the Toxins after Entering the Body?

- Approximately 50% converted by liver into carcinogens
- Metabolized in the bone marrow
- Stored in fat and re-released later (bioaccumulation)
- Smoking and alcohol increase risk of side effects

How do these toxins damage you?

- Direct damage to cells
- Metabolize into carcinogens
- Create free radicals in the liver

Mutation of Toxins into Carcinogens

- Free radicals damage intracellular proteins and DNA
- May create mutations and carcinogens leading to **Multiple Myeloma, Aplastic Anemia, Leukemia**, etc.

PARACELSUS (1493-1541)

"Poison is in everything,
and nothing is without poison.
The dosage makes it either
a poison or a remedy."

--Paracelsus, the "Father of Toxicology"

Agency for Toxic Substances & Disease Registry (ATSDR)

"The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present."

Clinical & Toxicology Study

Phase 1

Phase 2

Toxicology

Section 2

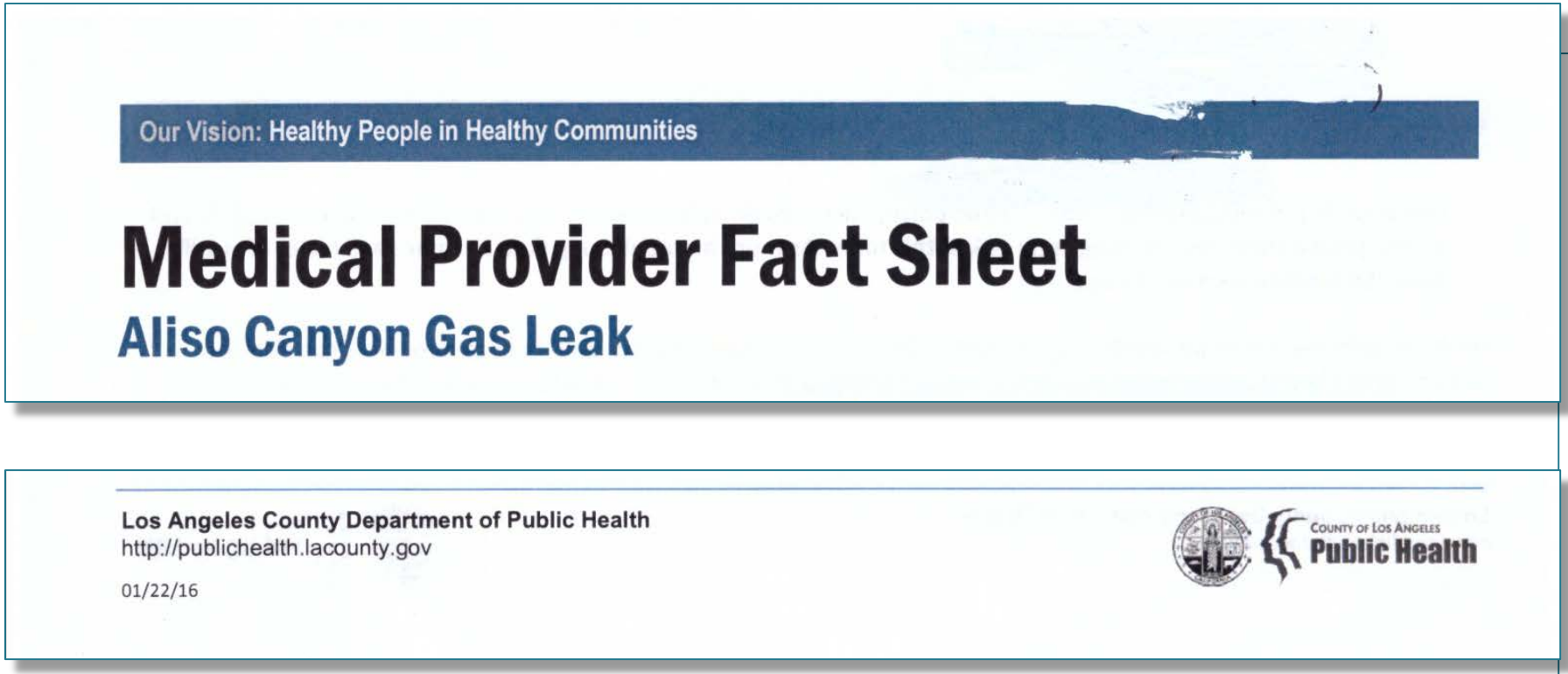
Phase 1 - Health Probe

- Initiated Health Probe in January 2016
- Performed by an M.D.

Phase 1 – Why?

- Number of patients seen in clinic
- Clinical presentations are unusual
- Government agencies doing nothing for them
- LACDPH letter…

Department of Public Health
"Fact Sheet" Sent to Doctors on Jan 22, 2016



Our Vision: Healthy People in Healthy Communities

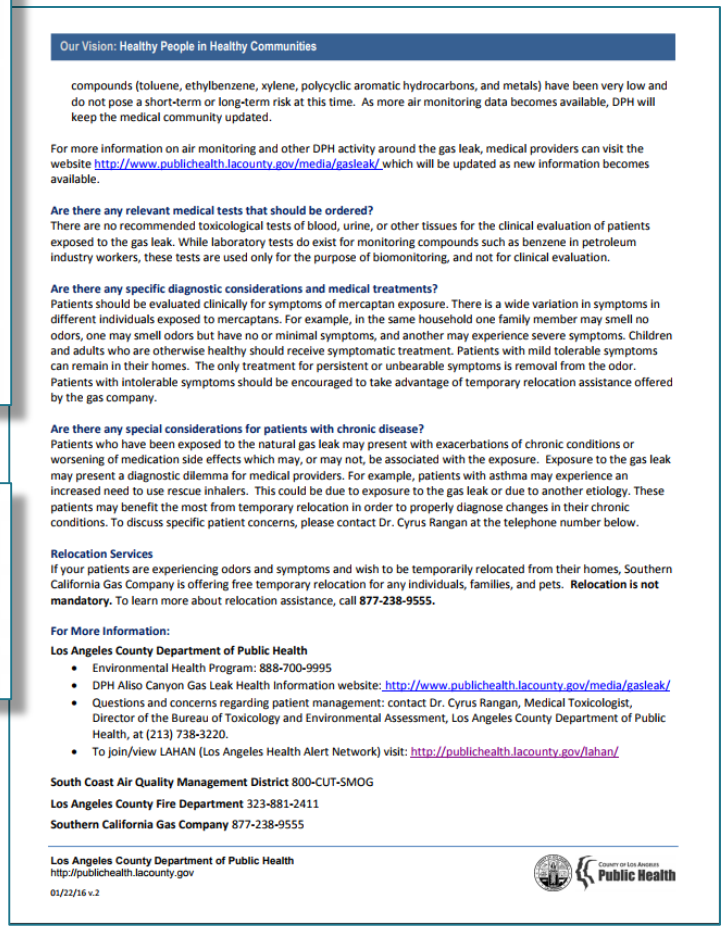
Medical Provider Fact Sheet

Aliso Canyon Gas Leak

Los Angeles County Department of Public Health
http://publichealth.lacounty.gov

01/22/16

County of Los Angeles Public Health



Our Vision: Healthy People in Healthy Communities

compounds (toluene, ethylbenzene, xylene, polycyclic aromatic hydrocarbons, and metals) have been very low and do not pose a short-term or long-term risk at this time. As more air monitoring data becomes available, DPH will keep the medical community updated.

For more information on air monitoring and other DPH activity around the gas leak, medical providers can visit the website http://www.publichealth.lacounty.gov/media/gasleak/ which will be updated as new information becomes available.

Are there any relevant medical tests that should be ordered?
There are no recommended toxicological tests of blood, urine, or other tissues for the clinical evaluation of patients exposed to the gas leak. While laboratory tests do exist for monitoring compounds such as benzene in petroleum industry workers, these tests are used only for the purpose of biomonitoring, and not for clinical evaluation.

Are there any specific diagnostic considerations and medical treatments?
Patients should be evaluated clinically for symptoms of mercaptan exposure. There is a wide variation in symptoms in different individuals exposed to mercaptans. For example, in the same household one family member may smell no odors, one may smell odors but have no or minimal symptoms, and another may experience severe symptoms. Children and adults who are otherwise healthy should receive symptomatic treatment. Patients with mild tolerable symptoms can remain in their homes. The only treatment for persistent or unbearable symptoms is removal from the odor. Patients with intolerable symptoms should be encouraged to take advantage of temporary relocation assistance offered by the gas company.

Are there any special considerations for patients with chronic disease?
Patients who have been exposed to the natural gas leak may present with exacerbations of chronic conditions or worsening of medication side effects which may, or may not, be associated with the exposure. Exposure to the gas leak may present a diagnostic dilemma for medical providers. For example, patients with asthma may experience an increased need to use rescue inhalers. This could be due to exposure to the gas leak or due to another etiology. These patients may benefit the most from temporary relocation in order to properly diagnose changes in their chronic conditions. To discuss specific patient concerns, please contact Dr. Cyrus Rangan at the telephone number below.

Relocation Services
If your patients are experiencing odors and symptoms and wish to be temporarily relocated from their homes, Southern California Gas Company is offering free temporary relocation for any individuals, families, and pets. **Relocation is not mandatory.** To learn more about relocation assistance, call **877-238-9555.**

For More Information:

Los Angeles County Department of Public Health

- Environmental Health Program: 888-700-9995
- DPH Aliso Canyon Gas Leak Health Information website: http://www.publichealth.lacounty.gov/media/gasleak/
- Questions and concerns regarding patient management: contact Dr. Cyrus Rangan, Medical Toxicologist, Director of the Bureau of Toxicology and Environmental Assessment, Los Angeles County Department of Public Health, at (213) 738-3220.
- To join/view LAHAN (Los Angeles Health Alert Network) visit: http://publichealth.lacounty.gov/lahan/

South Coast Air Quality Management District 800-CUT-SMOG

Los Angeles County Fire Department 323-881-2411

Southern California Gas Company 877-238-9555

Los Angeles County Department of Public Health
http://publichealth.lacounty.gov

01/22/16 v.2

County of Los Angeles Public Health

LACDPH Provider Fact Sheet - Jan 22, 2016

"There are no recommended toxicological tests of blood, urine, or other tissues for the clinical evaluation of patients exposed to the gas leak. While laboratory tests do exist for monitoring compounds such as benzene in petroleum industry workers, these tests are used only for the purpose of biomonitoring, and not for clinical evaluation." (Emphasis added.)

Phase 1 – Stats (January 2016)

Phase 1 Clinical	
Patients (min 2 symptoms)	52
Females	31
Males	21
Age Distribution	11-80
Age Concentration	40-60

Phase 1 – Health Problems

- Cough (greater than 4 weeks) 79%
- Headache 77%
- Nose Bleed 34%
- Dizziness 28%
- Nausea/Vomiting/Diarrhea 23%
- Eye Irritation 13%
- Rash 12%

Other Symptoms

- Tingling of hands and mouth
- Feeling unfocused
- Forgetfulness
- Dry mouth
- Laryngitis or change of voice
- Upper airway congestion
- Joint and body pain

Clinical & Toxicology Study

Phase 1

Phase 2

Toxicology

Section 2

Phase 2 – Stats (January 2017)

Phase 2 Clinical	
Patients (new)	72
Females	51
Males	21
Age Distribution	13-91

Phase 2 – Health Problems (January 2017)

- Headache 60% (compared to Phase 1 – 77%)
- Fatigue 55% (compared to Phase 1 – no data)
- Cough 51% (compared to Phase 1 – 79%)
- Nausea, vomiting, diarrhea 42% (compared to Phase 1 – 23%)
- Nosebleeds 31% (compared to Phase 1 – 34%)

One year later…health problems still persist

Phase 2 - Other Symptoms

- Rash
- Laryngitis, sore throat, sinus symptoms
- Memory loss
- Depression
- Hair loss
- Body pain
- Palpitations
- Vertigo
- Insomnia

Clinical & Toxicology Study
Phase 1
Phase 2
Toxicology

Section 2

Test Volatile Organic Compounds (VOC's) and Metals

- Urine Sample for VOCs
- Hair Sample for Metals
- **Why?**
  - **Because you asked**

Toxicology Study – Labs Selected

- **Great Plains Lab** in Kansas City, KS
- **Doctor's Data** in St. Charles, IL (Chicago area)
- Selected labs outside of California
  - Remove any bias or political influence
  - Trust had already become a concern among residents

DOCTOR'S DATA INC.

SCIENCE + INSIGHT

The Great Plains Laboratory, Inc.

GPL Key Staff & Qualifications

LABORATORY DIRECTOR | WILLIAM SHAW, PHD

- **William Shaw, PhD**, is board certified in the fields of clinical chemistry and toxicology by the American Board of Clinical Chemistry. Before he founded The Great Plains Laboratory, Inc., **Dr. Shaw worked for the Centers for Disease Control and Prevention (CDC),** Children's Mercy Hospital, University of Missouri at Kansas City School of Medicine, and Smith Kline Laboratories. He is the author of Biological Treatments for Autism and PDD, originally published in 1998 and Autism: Beyond the Basics, published in 2009. He is also a frequent speaker at conferences worldwide.

GPL Key Staff & Qualifications

ASSOCIATE LABORATORY DIRECTOR | MATTHEW PRATT-HYATT, PHD

- Matthew Pratt-Hyatt received his **PhD in cellular and molecular biology** from the University of Michigan. **Matt has trained under Dr. Paul Hollenberg, a prominent researcher on drug metabolism and Dr. Curtis Klaassen, one of the world's leading toxicologists**. He has over a dozen publications in well-known research journals such as PNAS and Cell Metabolism. At The Great Plains Laboratory, he is focused on assisting with diagnosis and treatment of mitochondrial disorders, neurological diseases, chronic immune diseases, and more. He specializes in developing tools that examine factors at the interface between genetics and toxicology. His work is bringing new insight into how genes and toxicants interact and how that may lead to mental health disorders, chronic health issues, and metabolism disorders.

GPL Testimonials

…"The anomalies of certain chemicals found in the samples were significant. This group was uniquely different than other similar testing we have done…therefore, we strongly suggest further investigation into these findings."

-- Great Plains Labs, Inc.

The Great Plains Laboratory, Inc.

Toxins in Urine

- After being ingested, toxins are:
  - Metabolized by the liver,
  - Dumped into the blood stream,
  - Cleared by the kidneys, and
  - Collected in the urine.

Findings – VOC Urine Testing

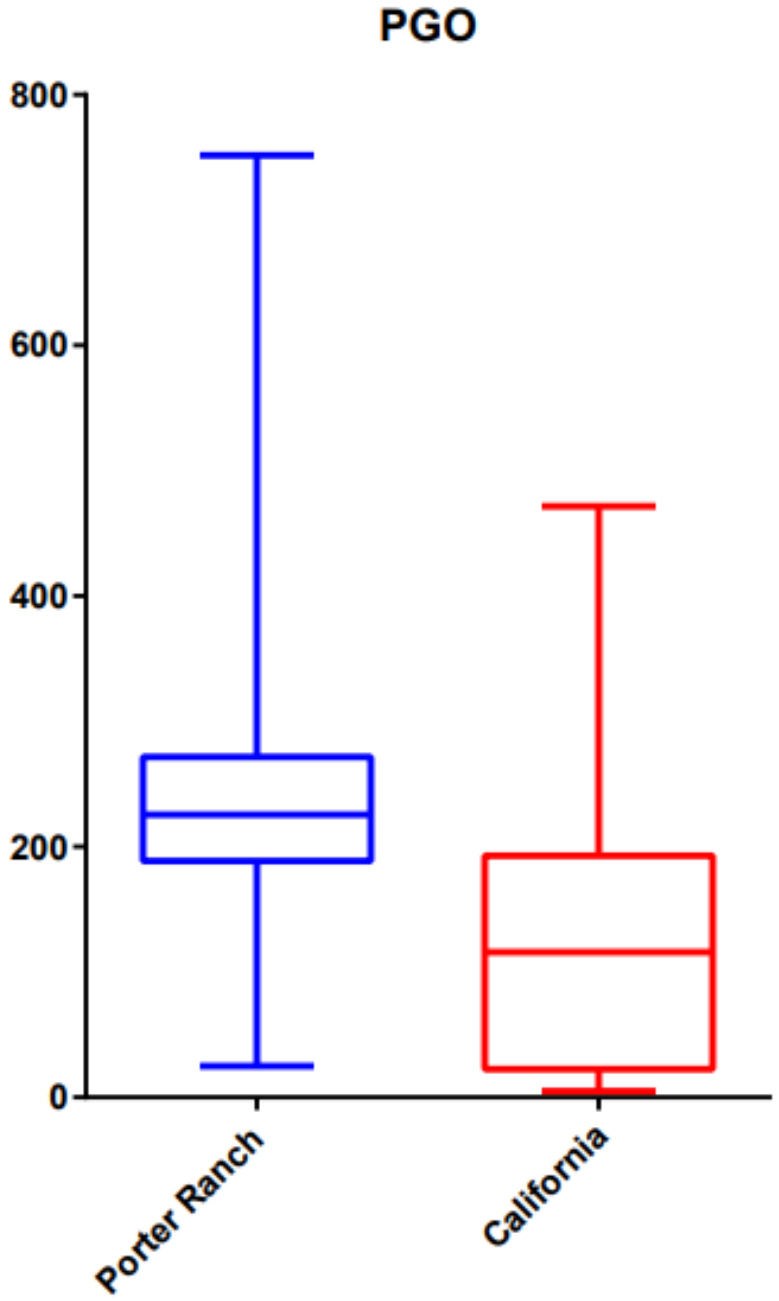
	Urine
Patients Tested	106
Females	70
Males	36
Age Distribution	3-79

So What Was Found in the Urine Tests?

- Evidence of the metabolism of Styrene & Ethylbenzene **– Phenylglyoxylic Acid ("PGO")**

PGO in Urine Tests

- Metabolite of Styrene and Ethylbenzene = PGO
- Local PGO levels are much higher than the rest of California
- P Value = .0005



What is a “P Value”

- <0.05 demonstrates a **statistical significance**
- The **lower the P Value** the **greater the difference** between test and control groups

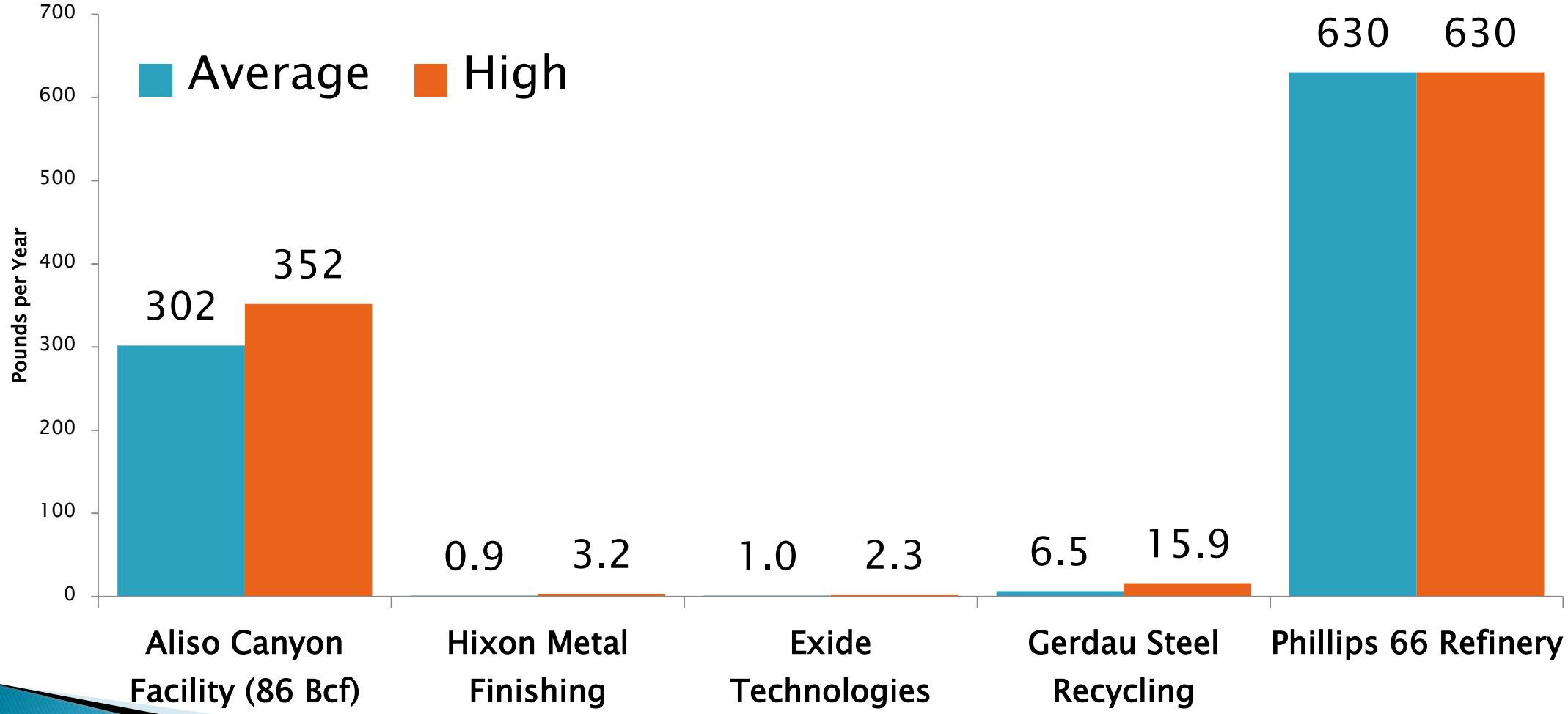
Styrene – Derivative of Benzene

- **Health Impact?**
  - **Known carcinogen –** especially in case of eye contact – also in case of skin contact, ingestion and inhalation

- Chronic exposure leads to
  - **tiredness/lethargy**,
  - **memory deficits**,
  - **headaches** and
  - **vertigo**

Aliso Canyon History of Ethylbenzene Release

(2000-2014 compared to 4 other companies in this air district)

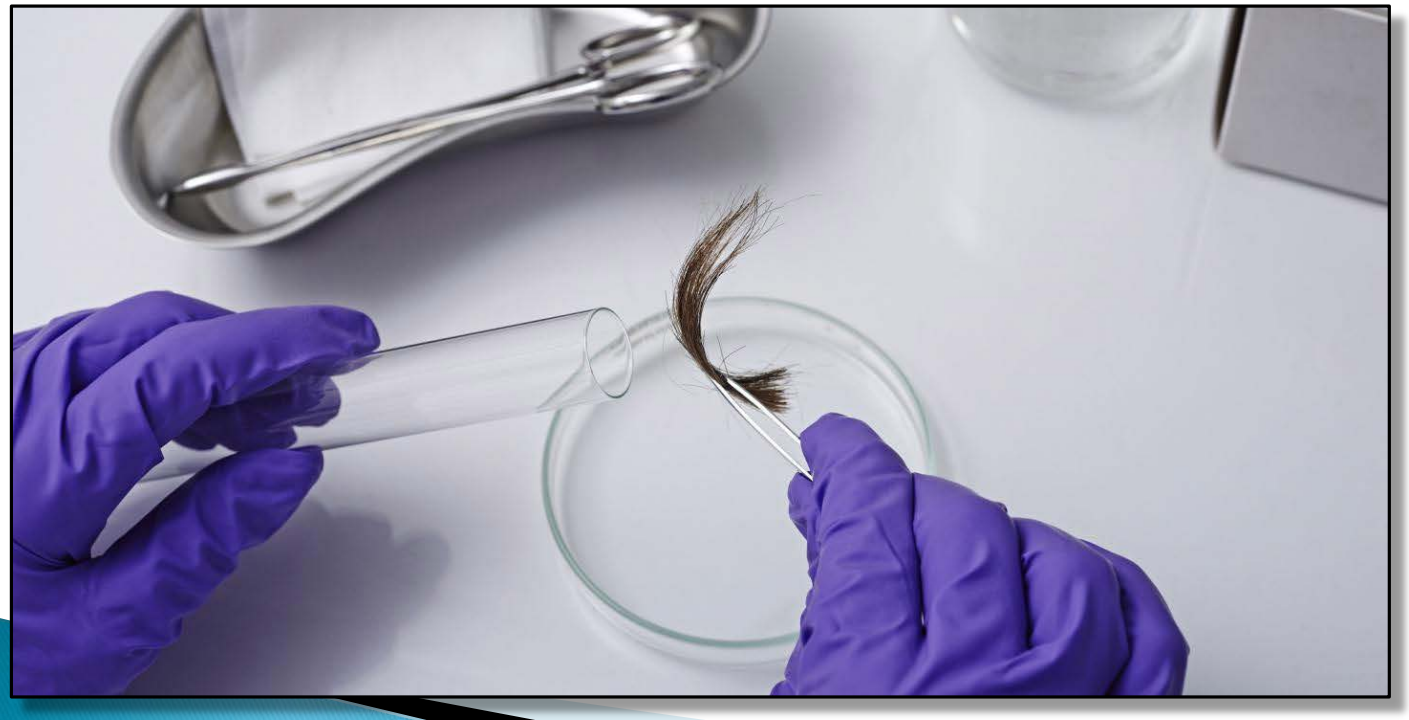


What about Benzene Itself in Urine Tests?

- Benzene metabolizes very quickly
- Didn’t anticipate to find, nor was Benzene found, at a significant level
- Keep in mind, testing 14 months ***after*** the blow out was shut down
- **There were patients that had a positive blood test for benzene in January 2016 – while Blow Out was active**

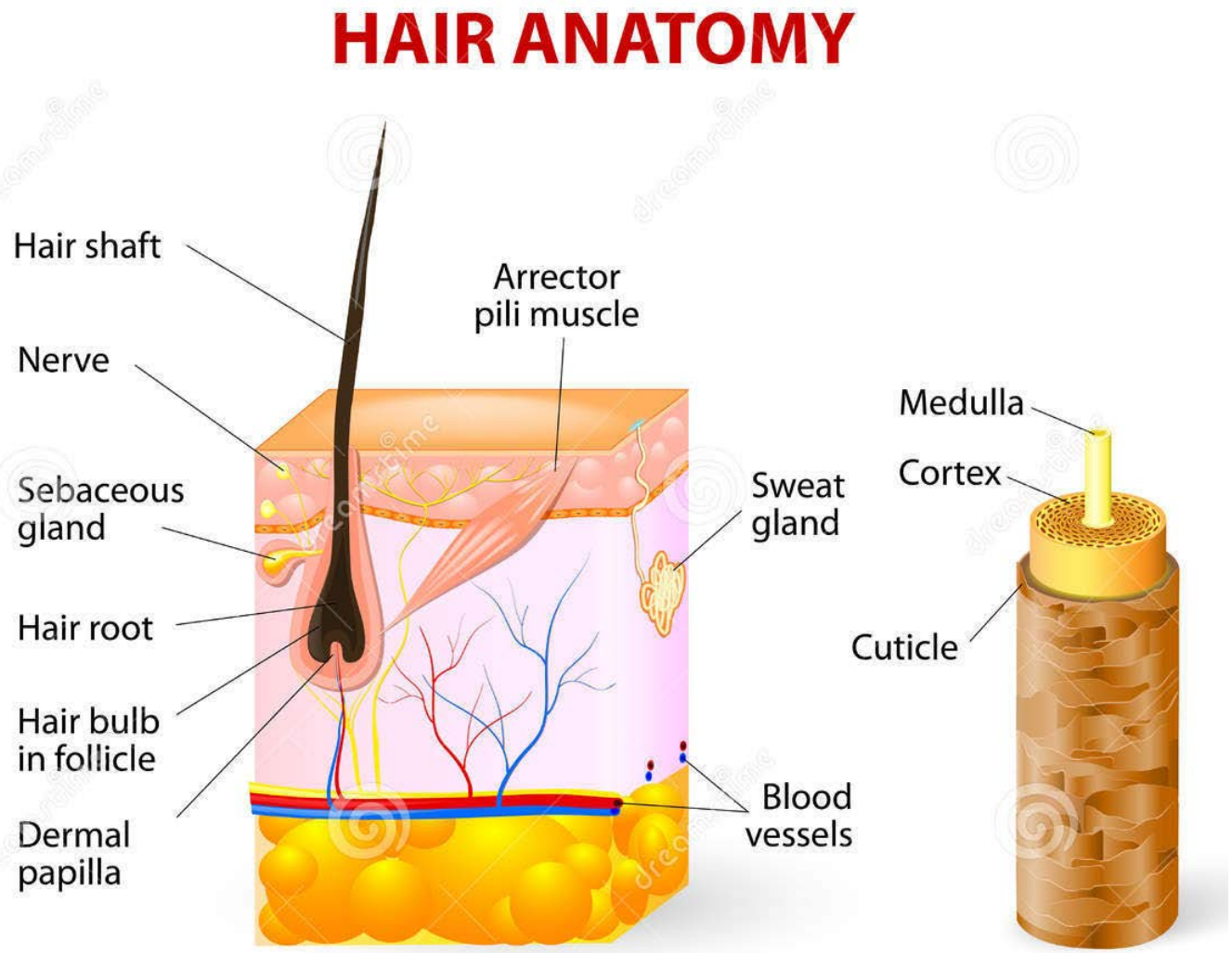
Now Let's Look at Hair Samples

- Testing for Metals
  - Such as Uranium, Lithium and others



Hair Testing and How it Works

- It takes approximately 2 to 3 months after ingestion, inhalation, or absorption for a toxin to show up in hair
- Hair shaft grows at about 1/2 inch in one month
- Different patients can have different rates depending on medical conditions



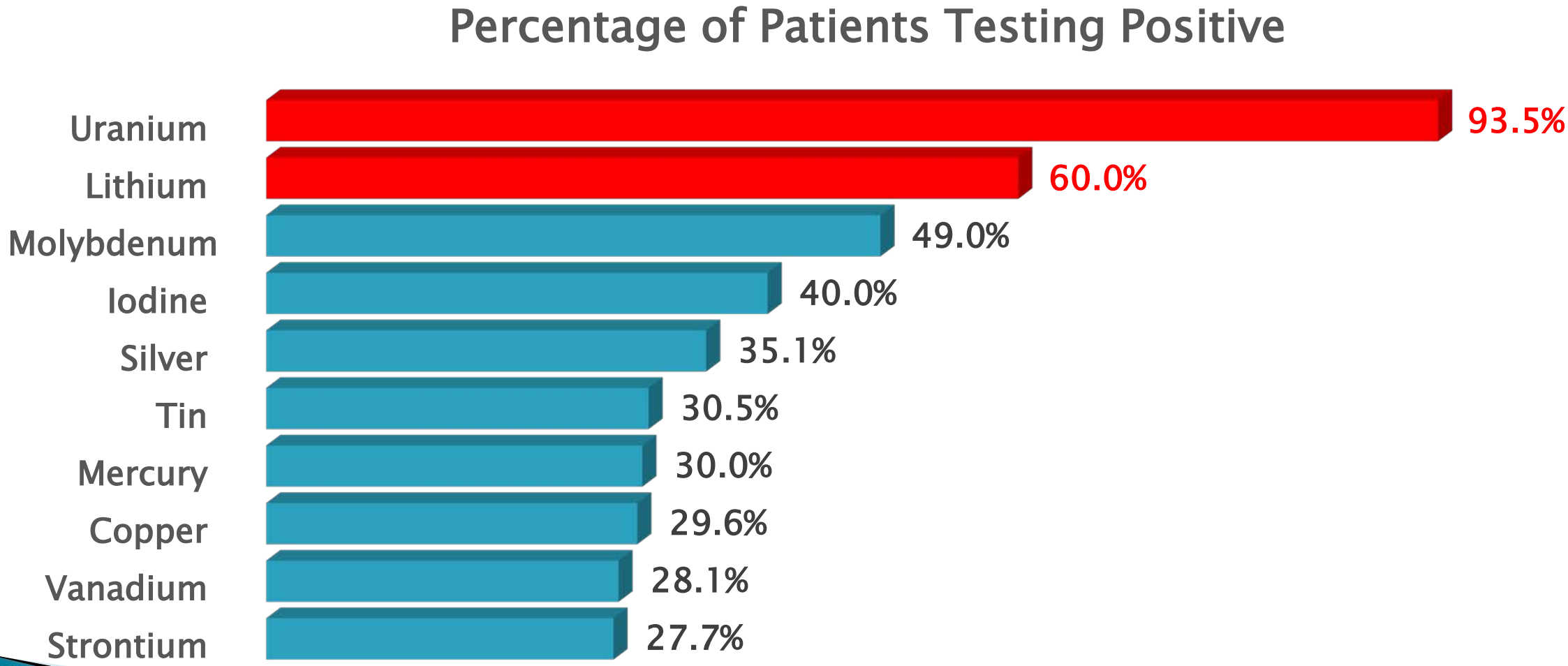
Findings

Section 3

Findings – Hair for Metals

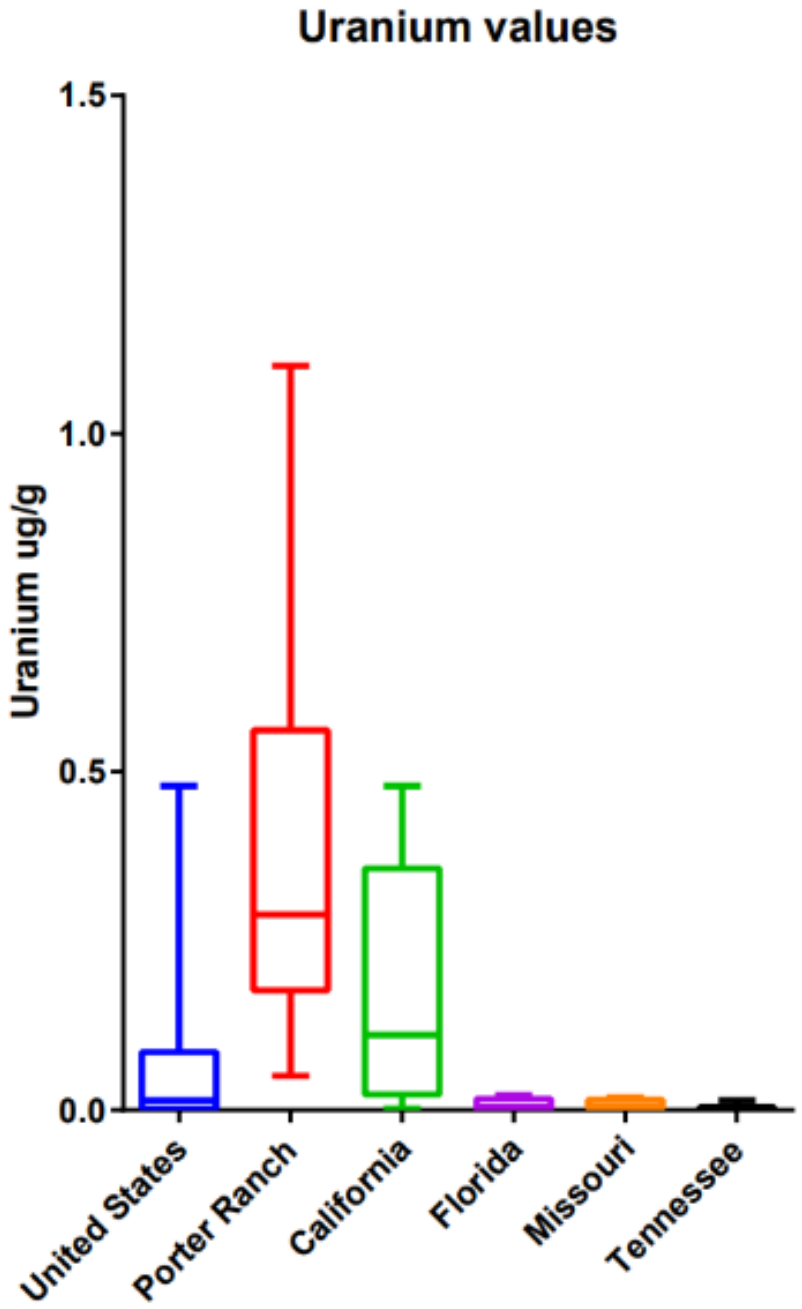
	Hair
Patients Tested	103
Females	62
Males	41
Age Distribution	3-80

Hair Analysis Screening – Top 10



Uranium Values

- Local Uranium Levels are **significantly greater** than control
- P-Value Uranium = **0.009**
  - The **lower the P Value** the **greater the difference** between test and control groups
  - <0.05 demonstrates a **statistical significance**



Uranium 238

- External exposure?
  - **Generally has no harmful effects**
- Internal exposure?
  - **Can be toxic to organ systems**
  - **Mutates DNA**

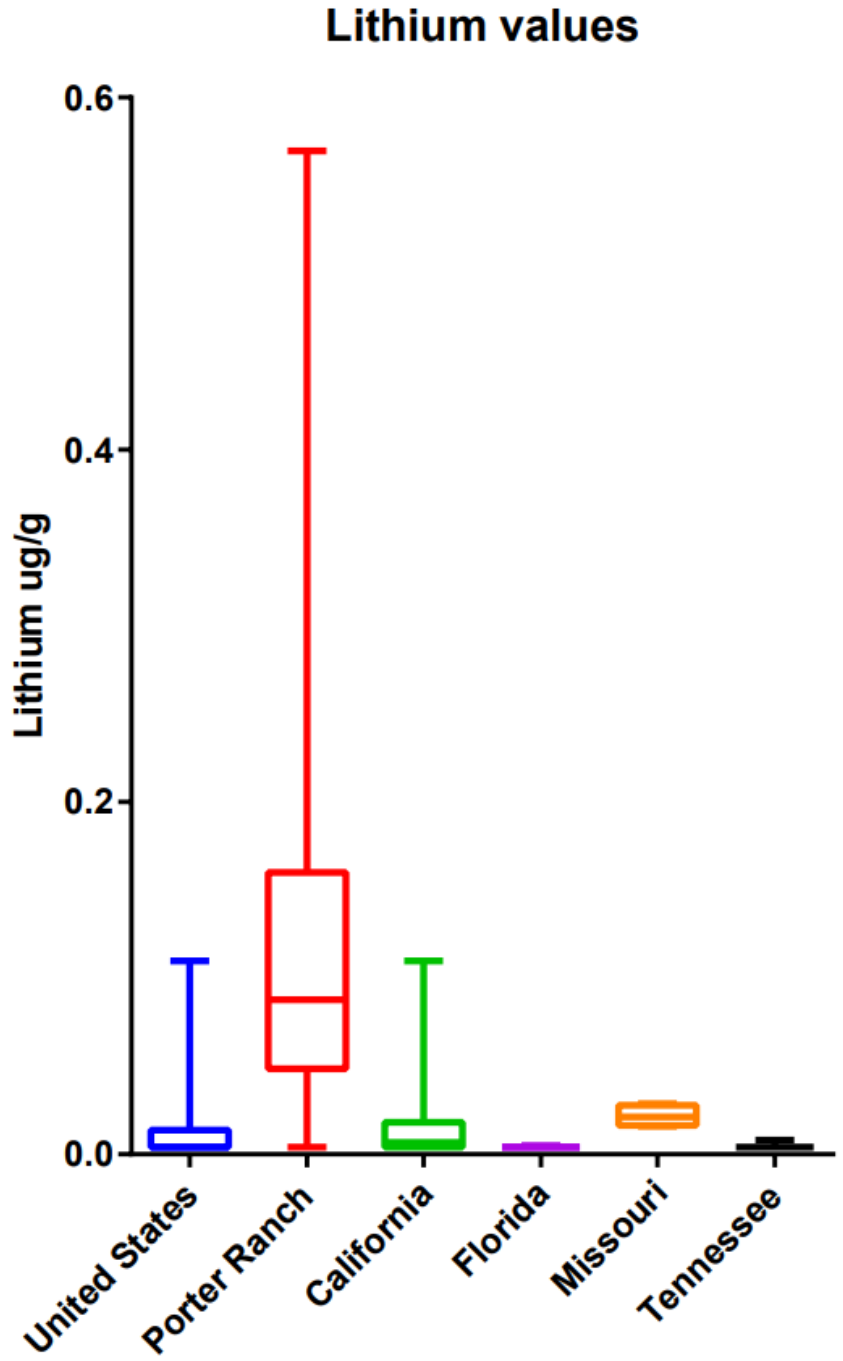
Uranium 238

- Accumulates in bone, liver, kidney, and reproductive tissues
  - Normal functioning of the kidney, brain, liver, heart, and other systems can be affected
  - Renal toxicity is a major adverse effect of uranium
- **Cancer risks** are associated with the radon decay product and can **increase lung cancer fivefold**

“Bib-Label Lithiated Lemon-Lime Soda”

Lithium Values

- Local Lithium values are **significantly higher** relative to control
- P Value Lithium = **0.0004**
  - The **lower the P Value** the **greater the difference** between test and control groups
  - <0.05 demonstrates a **statistical significance**



Lithium

- The soft drink 7Up was originally named "Bib-Label Lithiated Lemon-Lime Soda"
- The original 1929 formula included the mood-enhancing chemical lithium citrate
  - **Marketed as a cure for hangover**
- Removed from 7Up in 1948

Lithium – Health Impacts

- Nausea,
- Diarrhea,
- Dizziness,
- Muscle weakness,
- Fatigue,
- Dazed feeling
- Fine tremor,
- Frequent urination and thirst,
- Weight gain and swelling

Levels of Toxins Varies by:

- **Time spent in the community (24/7)**
  - Children who go to school in Porter Ranch
  - Adults who work from home
- **Distribution of the gases**
  - Wind carries the gases to different locations
- **Baseline health**
  - Pre-existing diagnosis's hypothyroid, migraine headaches, heart disease, hypertension…
- **Genetic makeup**

Toxin Results Also Vary by Home's Resistance Factor

- Age of the home
- Sealing around windows and doors (wood or other aluminum)
- Roofing (exposure to outside environment)
- North/South orientation of home
- Attached garage, time garage door open, entrance from garage
- Time percentage running of HVAC

How Long Has This Been Going On?

Testing Longer Hair

- Hair grows about ½ inch per month
- 2 years = ~12 inches of hair

- **Proximal** = closer to the body
- **Distal** = further from the body

Patient 1 Proximal (2017) vs. Distal (pre-2017)

Toxic & Essential Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 68th 95th
Aluminum	(Al)	3.7	< 7.0	
Antimony	(Sb)	0.015	< 0.050	
Arsenic	(As)	0.030	< 0.060	
Barium	(Ba)	1.3	< 2.0	
Beryllium	(Be)	< 0.01	< 0.020	
Bismuth	(Bi)	0.003	< 2.0	
Cadmium	(Cd)	< 0.009	< 0.050	
Lead	(Pb)	0.38	< 0.60	
Mercury	(Hg)	1.3	< 0.80	
Platinum	(Pt)	< 0.003	< 0.005	
Thallium	(Tl)	0.001	< 0.002	
Thorium	(Th)	0.002	< 0.002	
Uranium	(U)	0.32	< 0.060	
Nickel	(Ni)	0.27	< 0.30	
Silver	(Ag)	0.06	< 0.15	
Tin	(Sn)	0.04	< 0.30	
Titanium	(Ti)	1.9	< 0.70	
Total Toxic Representation				

ESSENTIAL AND OTHER ELEMENTS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Calcium	(Ca)	1100	300– 1200	
Magnesium	(Mg)	110	35– 120	
Sodium	(Na)	86	20– 250	
Potassium	(K)	66	8– 75	
Copper	(Cu)	100	11– 37	
Zinc	(Zn)	250	140– 220	
Manganese	(Mn)	0.35	0.08– 0.60	
Chromium	(Cr)	0.36	0.40– 0.65	
Vanadium	(V)	0.025	0.018– 0.065	
Molybdenum	(Mo)	0.051	0.020– 0.050	
Boron	(B)	0.84	0.25– 1.5	
Iodine	(I)	1.1	0.25– 1.8	
Lithium	(Li)	0.045	0.007– 0.020	
Phosphorus	(P)	155	150– 220	
Selenium	(Se)	0.92	0.55– 1.1	
Strontium	(Sr)	6.0	0.50– 7.6	
Sulfur	(S)	45800	44000– 50000	
Cobalt	(Co)	0.32	0.005– 0.040	
Iron	(Fe)	8.2	7.0– 16	
Germanium	(Ge)	0.031	0.030– 0.040	
Rubidium	(Rb)	0.067	0.007– 0.096	
Zirconium	(Zr)	0.59	0.020– 0.42	

Toxic & Essential Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 68th 95th
Aluminum	(Al)	3.3	< 7.0	
Antimony	(Sb)	0.037	< 0.050	
Arsenic	(As)	0.015	< 0.060	
Barium	(Ba)	3.5	< 2.0	
Beryllium	(Be)	< 0.01	< 0.020	
Bismuth	(Bi)	0.009	< 2.0	
Cadmium	(Cd)	0.053	< 0.050	
Lead	(Pb)	2.2	< 0.60	
Mercury	(Hg)	1.8	< 0.80	
Platinum	(Pt)	< 0.003	< 0.005	
Thallium	(Tl)	< 0.001	< 0.002	
Thorium	(Th)	0.002	< 0.002	
Uranium	(U)	0.17	< 0.060	
Nickel	(Ni)	1.5	< 0.30	
Silver	(Ag)	0.34	< 0.15	
Tin	(Sn)	0.17	< 0.30	
Titanium	(Ti)	0.97	< 0.70	
Total Toxic Representation				

ESSENTIAL AND OTHER ELEMENTS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Calcium	(Ca)	3520	300– 1200	
Magnesium	(Mg)	210	35– 120	
Sodium	(Na)	93	20– 250	
Potassium	(K)	44	8– 75	
Copper	(Cu)	250	11– 37	
Zinc	(Zn)	420	140– 220	
Manganese	(Mn)	0.78	0.08– 0.60	
Chromium	(Cr)	0.36	0.40– 0.65	
Vanadium	(V)	0.16	0.018– 0.065	
Molybdenum	(Mo)	0.074	0.020– 0.050	
Boron	(B)	2.0	0.25– 1.5	
Iodine	(I)	6.3	0.25– 1.8	
Lithium	(Li)	0.066	0.007– 0.020	
Phosphorus	(P)	121	150– 220	
Selenium	(Se)	0.69	0.55– 1.1	
Strontium	(Sr)	14	0.50– 7.6	
Sulfur	(S)	42300	44000– 50000	
Cobalt	(Co)	1.6	0.005– 0.040	
Iron	(Fe)	12	7.0– 16	
Germanium	(Ge)	0.042	0.030– 0.040	
Rubidium	(Rb)	0.040	0.007– 0.096	
Zirconium	(Zr)	0.97	0.020– 0.42	

Patient 2 Proximal (2017) vs. Distal (pre-2017)

Toxic & Essential Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 68th 95th
Aluminum	(Al)	3.0	< 7.0	
Antimony	(Sb)	< 0.01	< 0.050	
Arsenic	(As)	0.063	< 0.060	
Barium	(Ba)	0.32	< 2.0	
Beryllium	(Be)	< 0.01	< 0.020	
Bismuth	(Bi)	0.047	< 2.0	
Cadmium	(Cd)	0.010	< 0.050	
Lead	(Pb)	0.22	< 0.60	
Mercury	(Hg)	1.4	< 0.80	
Platinum	(Pt)	< 0.003	< 0.005	
Thallium	(Tl)	< 0.001	< 0.002	
Thorium	(Th)	< 0.001	< 0.002	
Uranium	(U)	0.47	< 0.060	
Nickel	(Ni)	0.03	< 0.30	
Silver	(Ag)	6.1	< 0.15	
Tin	(Sn)	0.08	< 0.30	
Titanium	(Ti)	0.51	< 0.70	
Total Toxic Representation				

ESSENTIAL AND OTHER ELEMENTS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Calcium	(Ca)	359	300– 1200	
Magnesium	(Mg)	17	35– 120	
Sodium	(Na)	320	20– 250	
Potassium	(K)	100	8– 75	
Copper	(Cu)	38	11– 37	
Zinc	(Zn)	150	140– 220	
Manganese	(Mn)	0.18	0.08– 0.60	
Chromium	(Cr)	0.46	0.40– 0.65	
Vanadium	(V)	0.078	0.018– 0.065	
Molybdenum	(Mo)	0.087	0.020– 0.050	
Boron	(B)	2.9	0.25– 1.5	
Iodine	(I)	1.6	0.25– 1.8	
Lithium	(Li)	0.022	0.007– 0.020	
Phosphorus	(P)	191	150– 220	
Selenium	(Se)	1.1	0.55– 1.1	
Strontium	(Sr)	1.2	0.50– 7.6	
Sulfur	(S)	45600	44000– 50000	
Cobalt	(Co)	0.003	0.005– 0.040	
Iron	(Fe)	8.9	7.0– 16	
Germanium	(Ge)	0.034	0.030– 0.040	
Rubidium	(Rb)	0.11	0.007– 0.096	
Zirconium	(Zr)	0.077	0.020– 0.42	

Toxic & Essential Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 68th 95th
Aluminum	(Al)	24	< 7.0	
Antimony	(Sb)	0.029	< 0.050	
Arsenic	(As)	0.017	< 0.060	
Barium	(Ba)	5.0	< 2.0	
Beryllium	(Be)	< 0.01	< 0.020	
Bismuth	(Bi)	0.13	< 2.0	
Cadmium	(Cd)	0.22	< 0.050	
Lead	(Pb)	0.93	< 0.60	
Mercury	(Hg)	1.2	< 0.80	
Platinum	(Pt)	< 0.003	< 0.005	
Thallium	(Tl)	< 0.001	< 0.002	
Thorium	(Th)	0.001	< 0.002	
Uranium	(U)	0.54	< 0.060	
Nickel	(Ni)	0.91	< 0.30	
Silver	(Ag)	4.0	< 0.15	
Tin	(Sn)	0.76	< 0.30	
Titanium	(Ti)	0.56	< 0.70	
Total Toxic Representation				

ESSENTIAL AND OTHER ELEMENTS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Calcium	(Ca)	5520	300– 1200	
Magnesium	(Mg)	260	35– 120	
Sodium	(Na)	40	20– 250	
Potassium	(K)	13	8– 75	
Copper	(Cu)	110	11– 37	
Zinc	(Zn)	250	140– 220	
Manganese	(Mn)	0.76	0.08– 0.60	
Chromium	(Cr)	0.54	0.40– 0.65	
Vanadium	(V)	0.078	0.018– 0.065	
Molybdenum	(Mo)	0.063	0.020– 0.050	
Boron	(B)	1.6	0.25– 1.5	
Iodine	(I)	4.8	0.25– 1.8	
Lithium	(Li)	0.030	0.007– 0.020	
Phosphorus	(P)	148	150– 220	
Selenium	(Se)	0.42	0.55– 1.1	
Strontium	(Sr)	20	0.50– 7.6	
Sulfur	(S)	42300	44000– 50000	
Cobalt	(Co)	0.54	0.005– 0.040	
Iron	(Fe)	40	7.0– 16	
Germanium	(Ge)	0.039	0.030– 0.040	
Rubidium	(Rb)	0.017	0.007– 0.096	
Zirconium	(Zr)	0.27	0.020– 0.42	

Patient 3 Proximal (2017) vs. Distal (pre-2017)

Toxic & Essential Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 68th – 95th
Aluminum	(Al)	5.1	< 7.0	
Antimony	(Sb)	0.019	< 0.050	
Arsenic	(As)	0.024	< 0.060	
Barium	(Ba)	0.54	< 2.0	
Beryllium	(Be)	< 0.01	< 0.020	
Bismuth	(Bi)	0.052	< 2.0	
Cadmium	(Cd)	< 0.009	< 0.050	
Lead	(Pb)	0.16	< 0.60	
Mercury	(Hg)	0.59	< 0.80	
Platinum	(Pt)	< 0.003	< 0.005	
Thallium	(Tl)	< 0.001	< 0.002	
Thorium	(Th)	< 0.001	< 0.002	
Uranium	(U)	0.85	< 0.060	
Nickel	(Ni)	0.17	< 0.30	
Silver	(Ag)	0.06	< 0.15	
Tin	(Sn)	0.20	< 0.30	
Titanium	(Ti)	1.0	< 0.70	
Total Toxic Representation				

ESSENTIAL AND OTHER ELEMENTS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 2.5th – 16th – 50th – 84th – 97.5th
Calcium	(Ca)	357	300– 1200	
Magnesium	(Mg)	23	35– 120	
Sodium	(Na)	5	20– 250	
Potassium	(K)	< 3	8– 75	
Copper	(Cu)	23	11– 37	
Zinc	(Zn)	130	140– 220	
Manganese	(Mn)	0.05	0.08– 0.60	
Chromium	(Cr)	0.41	0.40– 0.65	
Vanadium	(V)	0.080	0.018– 0.065	
Molybdenum	(Mo)	0.25	0.020– 0.050	
Boron	(B)	0.74	0.25– 1.5	
Iodine	(I)	2.0	0.25– 1.8	
Lithium	(Li)	< 0.004	0.007– 0.020	
Phosphorus	(P)	132	150– 220	
Selenium	(Se)	1.3	0.55– 1.1	
Strontium	(Sr)	1.7	0.50– 7.6	
Sulfur	(S)	48900	44000– 50000	
Cobalt	(Co)	0.004	0.005– 0.040	
Iron	(Fe)	7.6	7.0– 16	
Germanium	(Ge)	0.038	0.030– 0.040	
Rubidium	(Rb)	0.003	0.007– 0.096	
Zirconium	(Zr)	0.65	0.020– 0.42	

Toxic & Essential Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 68th – 95th
Aluminum	(Al)	12	< 7.0	
Antimony	(Sb)	0.038	< 0.050	
Arsenic	(As)	0.011	< 0.060	
Barium	(Ba)	2.0	< 2.0	
Beryllium	(Be)	< 0.01	< 0.020	
Bismuth	(Bi)	0.24	< 2.0	
Cadmium	(Cd)	0.022	< 0.050	
Lead	(Pb)	0.69	< 0.60	
Mercury	(Hg)	0.75	< 0.80	
Platinum	(Pt)	< 0.003	< 0.005	
Thallium	(Tl)	< 0.001	< 0.002	
Thorium	(Th)	< 0.001	< 0.002	
Uranium	(U)	1.2	< 0.060	
Nickel	(Ni)	1.8	< 0.30	
Silver	(Ag)	0.47	< 0.15	
Tin	(Sn)	1.6	< 0.30	
Titanium	(Ti)	1.6	< 0.70	
Total Toxic Representation				

ESSENTIAL AND OTHER ELEMENTS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 2.5th – 16th – 50th – 84th – 97.5th
Calcium	(Ca)	2300	300– 1200	
Magnesium	(Mg)	180	35– 120	
Sodium	(Na)	36	20– 250	
Potassium	(K)	4	8– 75	
Copper	(Cu)	140	11– 37	
Zinc	(Zn)	110	140– 220	
Manganese	(Mn)	0.20	0.08– 0.60	
Chromium	(Cr)	0.48	0.40– 0.65	
Vanadium	(V)	0.18	0.018– 0.065	
Molybdenum	(Mo)	0.12	0.020– 0.050	
Boron	(B)	1.2	0.25– 1.5	
Iodine	(I)	9.8	0.25– 1.8	
Lithium	(Li)	0.012	0.007– 0.020	
Phosphorus	(P)	90	150– 220	
Selenium	(Se)	0.88	0.55– 1.1	
Strontium	(Sr)	10	0.50– 7.6	
Sulfur	(S)	50300	44000– 50000	
Cobalt	(Co)	0.093	0.005– 0.040	
Iron	(Fe)	13	7.0– 16	
Germanium	(Ge)	0.045	0.030– 0.040	
Rubidium	(Rb)	0.006	0.007– 0.096	
Zirconium	(Zr)	2.3	0.020– 0.42	

Patient 4 Proximal (2017) vs. Distal (pre-2017)

Toxic & Essential Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 68th – 95th
Aluminum	(Al)	14	< 7.0	
Antimony	(Sb)	0.013	< 0.050	
Arsenic	(As)	0.058	< 0.060	
Barium	(Ba)	0.33	< 2.0	
Beryllium	(Be)	< 0.01	< 0.020	
Bismuth	(Bi)	0.25	< 2.0	
Cadmium	(Cd)	< 0.009	< 0.050	
Lead	(Pb)	0.75	< 0.60	
Mercury	(Hg)	1.7	< 0.80	
Platinum	(Pt)	< 0.003	< 0.005	
Thallium	(Tl)	< 0.001	< 0.002	
Thorium	(Th)	0.001	< 0.002	
Uranium	(U)	0.68	< 0.060	
Nickel	(Ni)	0.05	< 0.30	
Silver	(Ag)	0.21	< 0.15	
Tin	(Sn)	0.16	< 0.30	
Titanium	(Ti)	0.97	< 0.70	
Total Toxic Representation				

ESSENTIAL AND OTHER ELEMENTS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Calcium	(Ca)	556	300– 1200	
Magnesium	(Mg)	74	35– 120	
Sodium	(Na)	52	20– 250	
Potassium	(K)	23	8– 75	
Copper	(Cu)	45	11– 37	
Zinc	(Zn)	250	140– 220	
Manganese	(Mn)	0.09	0.08– 0.60	
Chromium	(Cr)	0.43	0.40– 0.65	
Vanadium	(V)	0.071	0.018– 0.065	
Molybdenum	(Mo)	0.070	0.020– 0.050	
Boron	(B)	1.3	0.25– 1.5	
Iodine	(I)	3.0	0.25– 1.8	
Lithium	(Li)	0.012	0.007– 0.020	
Phosphorus	(P)	178	150– 220	
Selenium	(Se)	0.96	0.55– 1.1	
Strontium	(Sr)	2.3	0.50– 7.6	
Sulfur	(S)	50700	44000– 50000	
Cobalt	(Co)	0.004	0.005– 0.040	
Iron	(Fe)	8.5	7.0– 16	
Germanium	(Ge)	0.038	0.030– 0.040	
Rubidium	(Rb)	0.023	0.007– 0.096	
Zirconium	(Zr)	0.063	0.020– 0.42	

Toxic & Essential Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 68th – 95th
Aluminum	(Al)	60	< 7.0	
Antimony	(Sb)	0.069	< 0.050	
Arsenic	(As)	0.033	< 0.060	
Barium	(Ba)	3.7	< 2.0	
Beryllium	(Be)	< 0.01	< 0.020	
Bismuth	(Bi)	1.7	< 2.0	
Cadmium	(Cd)	0.036	< 0.050	
Lead	(Pb)	4.4	< 0.60	
Mercury	(Hg)	1.8	< 0.80	
Platinum	(Pt)	< 0.003	< 0.005	
Thallium	(Tl)	< 0.001	< 0.002	
Thorium	(Th)	0.001	< 0.002	
Uranium	(U)	0.80	< 0.060	
Nickel	(Ni)	1.2	< 0.30	
Silver	(Ag)	2.1	< 0.15	
Tin	(Sn)	0.91	< 0.30	
Titanium	(Ti)	1.1	< 0.70	
Total Toxic Representation				

ESSENTIAL AND OTHER ELEMENTS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Calcium	(Ca)	6040	300– 1200	
Magnesium	(Mg)	420	35– 120	
Sodium	(Na)	25	20– 250	
Potassium	(K)	14	8– 75	
Copper	(Cu)	150	11– 37	
Zinc	(Zn)	750	140– 220	
Manganese	(Mn)	0.57	0.08– 0.60	
Chromium	(Cr)	0.41	0.40– 0.65	
Vanadium	(V)	0.18	0.018– 0.065	
Molybdenum	(Mo)	0.12	0.020– 0.050	
Boron	(B)	2.5	0.25– 1.5	
Iodine	(I)	35	0.25– 1.8	
Lithium	(Li)	0.14	0.007– 0.020	
Phosphorus	(P)	115	150– 220	
Selenium	(Se)	0.58	0.55– 1.1	
Strontium	(Sr)	18	0.50– 7.6	
Sulfur	(S)	41400	44000– 50000	
Cobalt	(Co)	0.063	0.005– 0.040	
Iron	(Fe)	26	7.0– 16	
Germanium	(Ge)	0.037	0.030– 0.040	
Rubidium	(Rb)	0.023	0.007– 0.096	
Zirconium	(Zr)	1.2	0.020– 0.42	

What about impact of hair treatments?

- 2 years of abuse
- Hair coloring
- Hair treatments of sprays, gels, etc.
- Hair dryers/heat

Patient 5-5 Proximal (2017) vs. Distal (pre-2017)

Toxic & Essential Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 68th 95th
Aluminum	(Al)	7.4	< 8.0	
Antimony	(Sb)	0.064	< 0.066	
Arsenic	(As)	0.058	< 0.080	
Barium	(Ba)	0.61	< 0.75	
Beryllium	(Be)	< 0.01	< 0.020	
Bismuth	(Bi)	0.035	< 2.0	
Cadmium	(Cd)	0.048	< 0.070	
Lead	(Pb)	0.93	< 1.0	
Mercury	(Hg)	0.70	< 0.40	
Platinum	(Pt)	< 0.003	< 0.005	
Thallium	(Tl)	0.001	< 0.002	
Thorium	(Th)	0.001	< 0.002	
Uranium	(U)	0.34	< 0.060	
Nickel	(Ni)	0.57	< 0.30	
Silver	(Ag)	2.2	< 0.20	
Tin	(Sn)	0.89	< 0.30	
Titanium	(Ti)	3.5	< 0.90	
Total Toxic Representation				

ESSENTIAL AND OTHER ELEMENTS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Calcium	(Ca)	313	140– 500	
Magnesium	(Mg)	37	15– 45	
Sodium	(Na)	23	18– 180	
Potassium	(K)	10	10– 150	
Copper	(Cu)	48	11– 24	
Zinc	(Zn)	180	100– 190	
Manganese	(Mn)	0.28	0.10– 0.50	
Chromium	(Cr)	0.53	0.43– 0.70	
Vanadium	(V)	0.23	0.030– 0.10	
Molybdenum	(Mo)	0.060	0.050– 0.13	
Boron	(B)	0.88	0.40– 3.5	
Iodine	(I)	2.3	0.25– 1.3	
Lithium	(Li)	0.013	0.007– 0.020	
Phosphorus	(P)	103	150– 220	
Selenium	(Se)	0.72	0.70– 1.1	
Strontium	(Sr)	1.4	0.19– 2.0	
Sulfur	(S)	44100	45500– 53000	
Cobalt	(Co)	0.013	0.005– 0.030	
Iron	(Fe)	9.3	7.0– 16	
Germanium	(Ge)	0.036	0.030– 0.040	
Rubidium	(Rb)	0.019	0.012– 0.16	
Zirconium	(Zr)	0.13	0.030– 1.0	

Toxic & Essential Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 68th 95th
Aluminum	(Al)	7.8	< 8.0	
Antimony	(Sb)	0.058	< 0.066	
Arsenic	(As)	0.028	< 0.080	
Barium	(Ba)	2.5	< 0.75	
Beryllium	(Be)	< 0.01	< 0.020	
Bismuth	(Bi)	< 0.002	< 2.0	
Cadmium	(Cd)	0.14	< 0.070	
Lead	(Pb)	0.70	< 1.0	
Mercury	(Hg)	0.97	< 0.40	
Platinum	(Pt)	< 0.003	< 0.005	
Thallium	(Tl)	< 0.001	< 0.002	
Thorium	(Th)	0.002	< 0.002	
Uranium	(U)	0.15	< 0.060	
Nickel	(Ni)	1.1	< 0.30	
Silver	(Ag)	1.2	< 0.20	
Tin	(Sn)	0.46	< 0.30	
Titanium	(Ti)	0.42	< 0.90	
Total Toxic Representation				

ESSENTIAL AND OTHER ELEMENTS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Calcium	(Ca)	2720	140– 500	
Magnesium	(Mg)	380	15– 45	
Sodium	(Na)	110	18– 180	
Potassium	(K)	35	10– 150	
Copper	(Cu)	120	11– 24	
Zinc	(Zn)	660	100– 190	
Manganese	(Mn)	0.63	0.10– 0.50	
Chromium	(Cr)	0.68	0.43– 0.70	
Vanadium	(V)	0.45	0.030– 0.10	
Molybdenum	(Mo)	0.017	0.050– 0.13	
Boron	(B)	2.1	0.40– 3.5	
Iodine	(I)	5.2	0.25– 1.3	
Lithium	(Li)	0.025	0.007– 0.020	
Phosphorus	(P)	89	150– 220	
Selenium	(Se)	0.64	0.70– 1.1	
Strontium	(Sr)	12	0.19– 2.0	
Sulfur	(S)	42700	45500– 53000	
Cobalt	(Co)	0.12	0.005– 0.030	
Iron	(Fe)	14	7.0– 16	
Germanium	(Ge)	0.042	0.030– 0.040	
Rubidium	(Rb)	0.045	0.012– 0.16	
Zirconium	(Zr)	0.11	0.030– 1.0	

Patient 6-3 Proximal (2017) vs. Distal (pre-2017)

Toxic & Essential Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL
Aluminum	(Al)	2.6	< 8.0
Antimony	(Sb)	0.012	< 0.066
Arsenic	(As)	0.036	< 0.080
Barium	(Ba)	0.14	< 0.75
Beryllium	(Be)	< 0.01	< 0.020
Bismuth	(Bi)	0.004	< 2.0
Cadmium	(Cd)	< 0.009	< 0.070
Lead	(Pb)	0.13	< 1.0
Mercury	(Hg)	0.03	< 0.40
Platinum	(Pt)	< 0.003	< 0.005
Thallium	(Tl)	< 0.001	< 0.002
Thorium	(Th)	< 0.001	< 0.002
Uranium	(U)	0.15	< 0.060
Nickel	(Ni)	0.03	< 0.30
Silver	(Ag)	0.01	< 0.20
Tin	(Sn)	0.11	< 0.30
Titanium	(Ti)	0.20	< 0.90
Total Toxic Representation			

PERCENTILE: 68th, 95th

ESSENTIAL AND OTHER ELEMENTS		RESULT µg/g	REFERENCE INTERVAL
Calcium	(Ca)	238	140– 500
Magnesium	(Mg)	17	15– 45
Sodium	(Na)	16	18– 180
Potassium	(K)	19	10– 150
Copper	(Cu)	48	11– 24
Zinc	(Zn)	180	100– 190
Manganese	(Mn)	0.06	0.10– 0.50
Chromium	(Cr)	0.47	0.43– 0.70
Vanadium	(V)	0.097	0.030– 0.10
Molybdenum	(Mo)	0.40	0.050– 0.13
Boron	(B)	1.4	0.40– 3.5
Iodine	(I)	0.57	0.25– 1.3
Lithium	(Li)	0.015	0.007– 0.020
Phosphorus	(P)	141	150– 220
Selenium	(Se)	0.82	0.70– 1.1
Strontium	(Sr)	0.60	0.19– 2.0
Sulfur	(S)	49600	45500– 53000
Cobalt	(Co)	0.003	0.005– 0.030
Iron	(Fe)	4.3	7.0– 16
Germanium	(Ge)	0.038	0.030– 0.040
Rubidium	(Rb)	0.024	0.012– 0.16
Zirconium	(Zr)	0.55	0.030– 1.0

PERCENTILE: 2.5th, 16th, 50th, 84th, 97.5th

Toxic & Essential Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL
Aluminum	(Al)	12	< 8.0
Antimony	(Sb)	0.13	< 0.066
Arsenic	(As)	0.024	< 0.080
Barium	(Ba)	0.87	< 0.75
Beryllium	(Be)	< 0.01	< 0.020
Bismuth	(Bi)	0.029	< 2.0
Cadmium	(Cd)	0.067	< 0.070
Lead	(Pb)	0.79	< 1.0
Mercury	(Hg)	0.14	< 0.40
Platinum	(Pt)	< 0.003	< 0.005
Thallium	(Tl)	< 0.001	< 0.002
Thorium	(Th)	< 0.001	< 0.002
Uranium	(U)	0.20	< 0.060
Nickel	(Ni)	0.18	< 0.30
Silver	(Ag)	0.23	< 0.20
Tin	(Sn)	1.5	< 0.30
Titanium	(Ti)	0.33	< 0.90
Total Toxic Representation			

PERCENTILE: 68th, 95th

ESSENTIAL AND OTHER ELEMENTS		RESULT µg/g	REFERENCE INTERVAL
Calcium	(Ca)	607	140– 500
Magnesium	(Mg)	48	15– 45
Sodium	(Na)	9	18– 180
Potassium	(K)	7	10– 150
Copper	(Cu)	110	11– 24
Zinc	(Zn)	230	100– 190
Manganese	(Mn)	0.21	0.10– 0.50
Chromium	(Cr)	0.56	0.43– 0.70
Vanadium	(V)	0.37	0.030– 0.10
Molybdenum	(Mo)	0.51	0.050– 0.13
Boron	(B)	2.1	0.40– 3.5
Iodine	(I)	4.9	0.25– 1.3
Lithium	(Li)	0.014	0.007– 0.020
Phosphorus	(P)	98	150– 220
Selenium	(Se)	0.61	0.70– 1.1
Strontium	(Sr)	2.5	0.19– 2.0
Sulfur	(S)	44700	45500– 53000
Cobalt	(Co)	0.023	0.005– 0.030
Iron	(Fe)	7.0	7.0– 16
Germanium	(Ge)	0.035	0.030– 0.040
Rubidium	(Rb)	0.007	0.012– 0.16
Zirconium	(Zr)	2.6	0.030– 1.0

PERCENTILE: 2.5th, 16th, 50th, 84th, 97.5th

Patient 7 Proximal (2017) vs. Distal (pre-2017)

Toxic & Essential Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL
Aluminum	(Al)	7.3	< 7.0
Antimony	(Sb)	0.091	< 0.066
Arsenic	(As)	0.092	< 0.080
Barium	(Ba)	1.1	< 1.0
Beryllium	(Be)	< 0.01	< 0.020
Bismuth	(Bi)	0.13	< 2.0
Cadmium	(Cd)	0.040	< 0.065
Lead	(Pb)	1.2	< 0.80
Mercury	(Hg)	0.97	< 0.80
Platinum	(Pt)	< 0.003	< 0.005
Thallium	(Tl)	0.002	< 0.002
Thorium	(Th)	0.001	< 0.002
Uranium	(U)	0.020	< 0.060
Nickel	(Ni)	0.21	< 0.20
Silver	(Ag)	6.8	< 0.08
Tin	(Sn)	1.0	< 0.30
Titanium	(Ti)	0.78	< 0.60
Total Toxic Representation			

PERCENTILE: 68th, 95th

ESSENTIAL AND OTHER ELEMENTS		RESULT µg/g	REFERENCE INTERVAL
Calcium	(Ca)	440	200– 750
Magnesium	(Mg)	78	25– 75
Sodium	(Na)	530	20– 180
Potassium	(K)	230	9– 80
Copper	(Cu)	15	11– 30
Zinc	(Zn)	110	130– 200
Manganese	(Mn)	1.2	0.08– 0.50
Chromium	(Cr)	0.57	0.40– 0.70
Vanadium	(V)	0.070	0.018– 0.065
Molybdenum	(Mo)	0.061	0.025– 0.060
Boron	(B)	8.8	0.40– 3.0
Iodine	(I)	1.5	0.25– 1.8
Lithium	(Li)	0.021	0.007– 0.020
Phosphorus	(P)	158	150– 220
Selenium	(Se)	0.83	0.70– 1.2
Strontium	(Sr)	1.1	0.30– 3.5
Sulfur	(S)	43800	44000– 50000
Cobalt	(Co)	0.020	0.004– 0.020
Iron	(Fe)	16	7.0– 16
Germanium	(Ge)	0.035	0.030– 0.040
Rubidium	(Rb)	0.23	0.011– 0.12
Zirconium	(Zr)	0.20	0.020– 0.44

PERCENTILE: 2.5th, 16th, 50th, 84th, 97.5th

Toxic & Essential Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL
Aluminum	(Al)	88	< 7.0
Antimony	(Sb)	3.3	< 0.066
Arsenic	(As)	0.12	< 0.080
Barium	(Ba)	27	< 1.0
Beryllium	(Be)	< 0.01	< 0.020
Bismuth	(Bi)	0.67	< 2.0
Cadmium	(Cd)	0.25	< 0.065
Lead	(Pb)	3.7	< 0.80
Mercury	(Hg)	0.76	< 0.80
Platinum	(Pt)	< 0.003	< 0.005
Thallium	(Tl)	0.001	< 0.002
Thorium	(Th)	0.017	< 0.002
Uranium	(U)	0.23	< 0.060
Nickel	(Ni)	2.9	< 0.20
Silver	(Ag)	12	< 0.08
Tin	(Sn)	2.2	< 0.30
Titanium	(Ti)	2.7	< 0.60
Total Toxic Representation			

PERCENTILE: 68th, 95th

ESSENTIAL AND OTHER ELEMENTS		RESULT µg/g	REFERENCE INTERVAL
Calcium	(Ca)	3410	200– 750
Magnesium	(Mg)	310	25– 75
Sodium	(Na)	210	20– 180
Potassium	(K)	87	9– 80
Copper	(Cu)	27	11– 30
Zinc	(Zn)	130	130– 200
Manganese	(Mn)	4.6	0.08– 0.50
Chromium	(Cr)	10	0.40– 0.70
Vanadium	(V)	0.35	0.018– 0.065
Molybdenum	(Mo)	0.15	0.025– 0.060
Boron	(B)	3.1	0.40– 3.0
Iodine	(I)	5.1	0.25– 1.8
Lithium	(Li)	0.061	0.007– 0.020
Phosphorus	(P)	118	150– 220
Selenium	(Se)	0.47	0.70– 1.2
Strontium	(Sr)	24	0.30– 3.5
Sulfur	(S)	35100	44000– 50000
Cobalt	(Co)	0.15	0.004– 0.020
Iron	(Fe)	140	7.0– 16
Germanium	(Ge)	0.036	0.030– 0.040
Rubidium	(Rb)	0.18	0.011– 0.12
Zirconium	(Zr)	1.8	0.020– 0.44

PERCENTILE: 2.5th, 16th, 50th, 84th, 97.5th

Patient 7 Proximal (2017) vs. Distal (pre-2017)

Toxic & Essential Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 68th 95th
Aluminum	(Al)	88	< 7.0	
Antimony	(Sb)	3.3	< 0.066	
Arsenic	(As)	0.12	< 0.080	
Barium	(Ba)	27	< 1.0	
Beryllium	(Be)	< 0.01	< 0.020	
Bismuth	(Bi)	0.67	< 2.0	
Cadmium	(Cd)	0.25	< 0.065	
Lead	(Pb)	3.7	< 0.80	
Mercury	(Hg)	0.76	< 0.80	
Platinum	(Pt)	< 0.003	< 0.005	
Thallium	(Tl)	0.001	< 0.002	
Thorium	(Th)	0.017	< 0.002	
Uranium	(U)	0.23	< 0.060	
Nickel	(Ni)	2.9	< 0.20	
Silver	(Ag)	12	< 0.08	
Tin	(Sn)	2.2	< 0.30	
Titanium	(Ti)	2.7	< 0.60	
Total Toxic Representation				

ESSENTIAL AND OTHER ELEMENTS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Calcium	(Ca)	3410	200- 750	
Magnesium	(Mg)	310	25- 75	
Sodium	(Na)	210	20- 180	
Potassium	(K)	87	9- 80	
Copper	(Cu)	27	11- 30	
Zinc	(Zn)	130	130- 200	
Manganese	(Mn)	4.6	0.08- 0.50	
Chromium	(Cr)	10	0.40- 0.70	
Vanadium	(V)	0.35	0.018- 0.065	
Molybdenum	(Mo)	0.15	0.025- 0.060	
Boron	(B)	3.1	0.40- 3.0	
Iodine	(I)	5.1	0.25- 1.8	
Lithium	(Li)	0.061	0.007- 0.020	
Phosphorus	(P)	118	150- 220	
Selenium	(Se)	0.47	0.70- 1.2	
Strontium	(Sr)	24	0.30- 3.5	
Sulfur	(S)	35100	44000- 50000	
Cobalt	(Co)	0.15	0.004- 0.020	
Iron	(Fe)	140	7.0- 16	
Germanium	(Ge)	0.036	0.030- 0.040	
Rubidium	(Rb)	0.18	0.011- 0.12	
Zirconium	(Zr)	1.8	0.020- 0.44	

Toxic & Essential Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 68th 95th
Aluminum	(Al)	82	< 7.0	
Antimony	(Sb)	1.1	< 0.066	
Arsenic	(As)	0.12	< 0.080	
Barium	(Ba)	24	< 1.0	
Beryllium	(Be)	< 0.01	< 0.020	
Bismuth	(Bi)	0.54	< 2.0	
Cadmium	(Cd)	0.43	< 0.065	
Lead	(Pb)	3.2	< 0.80	
Mercury	(Hg)	0.55	< 0.80	
Platinum	(Pt)	< 0.003	< 0.005	
Thallium	(Tl)	0.001	< 0.002	
Thorium	(Th)	0.013	< 0.002	
Uranium	(U)	0.25	< 0.060	
Nickel	(Ni)	4.4	< 0.20	
Silver	(Ag)	12	< 0.08	
Tin	(Sn)	1.9	< 0.30	
Titanium	(Ti)	2.3	< 0.60	
Total Toxic Representation				

ESSENTIAL AND OTHER ELEMENTS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Calcium	(Ca)	4210	200- 750	
Magnesium	(Mg)	350	25- 75	
Sodium	(Na)	410	20- 180	
Potassium	(K)	180	9- 80	
Copper	(Cu)	27	11- 30	
Zinc	(Zn)	130	130- 200	
Manganese	(Mn)	4.4	0.08- 0.50	
Chromium	(Cr)	8.3	0.40- 0.70	
Vanadium	(V)	0.30	0.018- 0.065	
Molybdenum	(Mo)	0.14	0.025- 0.060	
Boron	(B)	3.5	0.40- 3.0	
Iodine	(I)	5.0	0.25- 1.8	
Lithium	(Li)	0.060	0.007- 0.020	
Phosphorus	(P)	115	150- 220	
Selenium	(Se)	0.59	0.70- 1.2	
Strontium	(Sr)	28	0.30- 3.5	
Sulfur	(S)	35400	44000- 50000	
Cobalt	(Co)	0.19	0.004- 0.020	
Iron	(Fe)	130	7.0- 16	
Germanium	(Ge)	0.041	0.030- 0.040	
Rubidium	(Rb)	0.19	0.011- 0.12	
Zirconium	(Zr)	2.0	0.020- 0.44	

Health Care to Treat Toxic Exposures

Treatment – What can you do?

- Sauna baths
- Skin is an organ of secretion
- Sweat helps remove chemicals

What can you do?

- **Glutathione** (GSH) is an important antioxidant
  - May prevent damage to cells caused by reactive oxygen species such as free radicals and heavy metals
  - Oral ingestion is limited – GSH is made within the liver from the protein synthesis process.

What can you do?

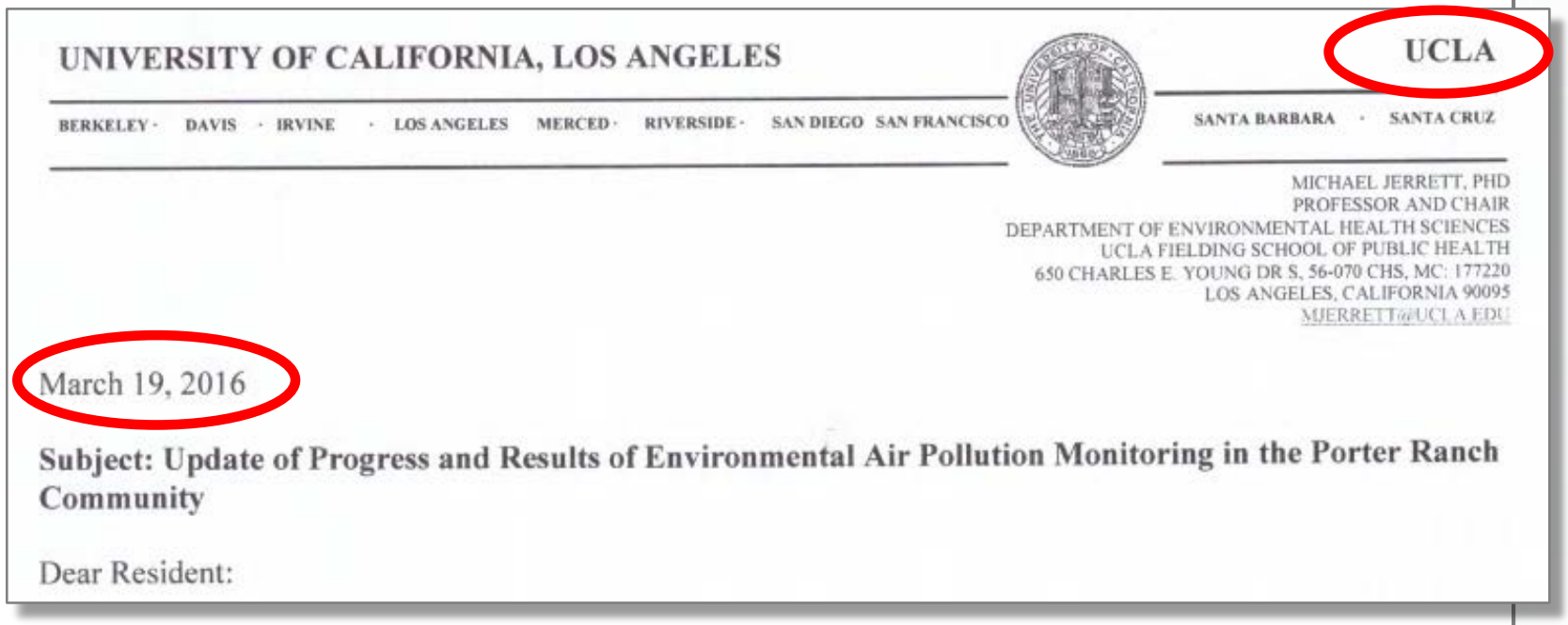
- **Cysteine**, a nonessential amino acid, and is the rate-limiting factor in cellular glutathione biosynthesis.

- Found in –
  - meats (poultry, beef loin, pork chops, lamb),
  - dairy, eggs
  - plant foods (red peppers, garlic, onions, broccoli, brussels sprout, oats, granola, wheat germ, sprouted lentils)

What has Been Done for the Community?

Section 4

UCLA Letter – Dated March 19, 2016



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UCLA

SANTA BARBARA · SANTA CRUZ

MICHAEL JERRETT, PHD
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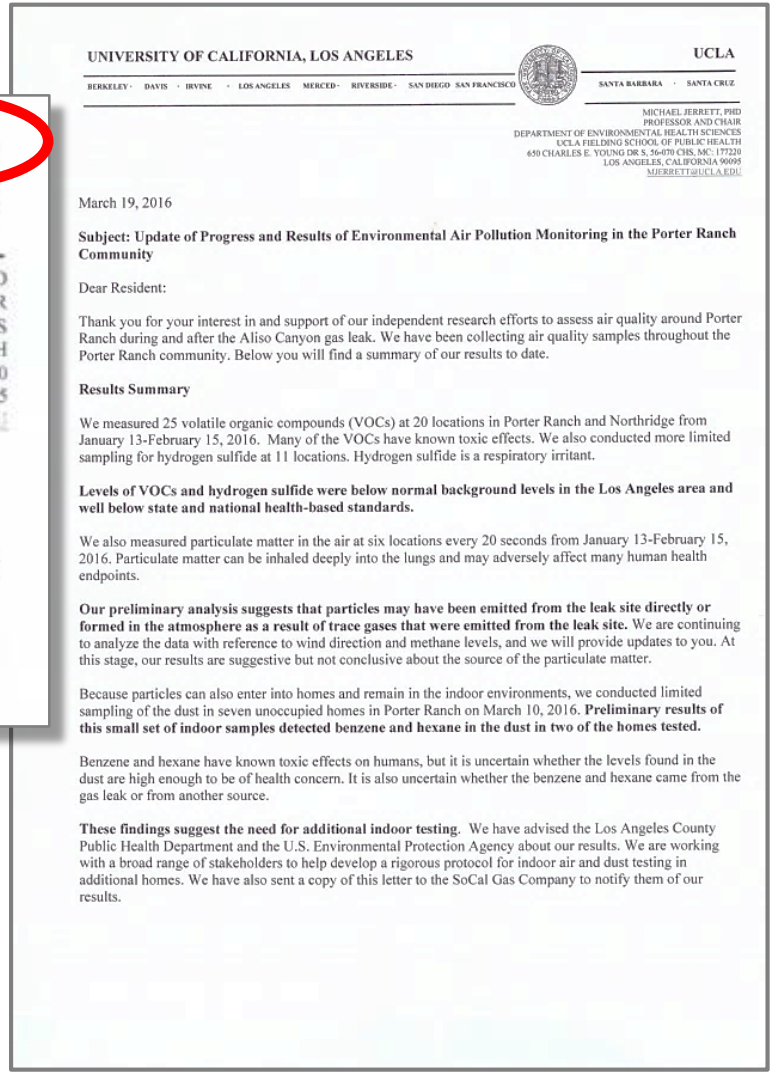
UCLA FIELDING SCHOOL OF PUBLIC HEALTH
650 CHARLES E. YOUNG DR S, 56-070 CHS, MC: 177220
LOS ANGELES, CALIFORNIA 90095
MJERRETT@UCLA.EDU

March 19, 2016

Subject: Update of Progress and Results of Environmental Air Pollution Monitoring in the Porter Ranch Community

Dear Resident:



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MJERRETT@UCLA.EDU

March 19, 2016

Subject: Update of Progress and Results of Environmental Air Pollution Monitoring in the Porter Ranch Community

Dear Resident:

Thank you for your interest in and support of our independent research efforts to assess air quality around Porter Ranch during and after the Aliso Canyon gas leak. We have been collecting air quality samples throughout the Porter Ranch community. Below you will find a summary of our results to date.

Results Summary

We measured 25 volatile organic compounds (VOCs) at 20 locations in Porter Ranch and Northridge from January 13-February 15, 2016. Many of the VOCs have known toxic effects. We also conducted more limited sampling for hydrogen sulfide at 11 locations. Hydrogen sulfide is a respiratory irritant.

Levels of VOCs and hydrogen sulfide were below normal background levels in the Los Angeles area and well below state and national health-based standards.

We also measured particulate matter in the air at six locations every 20 seconds from January 13-February 15, 2016. Particulate matter can be inhaled deeply into the lungs and may adversely affect many human health endpoints.

Our preliminary analysis suggests that particles may have been emitted from the leak site directly or formed in the atmosphere as a result of trace gases that were emitted from the leak site. We are continuing to analyze the data with reference to wind direction and methane levels, and we will provide updates to you. At this stage, our results are suggestive but not conclusive about the source of the particulate matter.

Because particles can also enter into homes and remain in the indoor environments, we conducted limited sampling of the dust in seven unoccupied homes in Porter Ranch on March 10, 2016. **Preliminary results of this small set of indoor samples detected benzene and hexane in the dust in two of the homes tested.**

Benzene and hexane have known toxic effects on humans, but it is uncertain whether the levels found in the dust are high enough to be of health concern. It is also uncertain whether the benzene and hexane came from the gas leak or from another source.

These findings suggest the need for additional indoor testing. We have advised the Los Angeles County Public Health Department and the U.S. Environmental Protection Agency about our results. We are working with a broad range of stakeholders to help develop a rigorous protocol for indoor air and dust testing in additional homes. We have also sent a copy of this letter to the SoCal Gas Company to notify them of our results.

UCLA Letter – Dated March 19, 2016

- **During the Blow Out UCLA was on scene**
- Air Testing done January 13, 2016 to February 15, 2016
- Measured 25 volatile organic compounds (VOCs) in the air from 20 locations

“Many of the VOCs have known toxic effects”

UCLA Letter – Dated March 19, 2016

- Noted particulate matter in the air from 6 locations

"Particulate matter can be inhaled deeply into lungs and may adversely affect many human health endpoints"

- Results: Negative for VOCs and hydrogen sulfide

UCLA Letter – Dated March 19, 2016

- These elements can find their way into homes so, **dust samples** were taken in **7 unoccupied** homes in Porter Ranch – **March 10th, 2016**

"Preliminary results…detected

benzene and hexane

in the dust in two of the homes tested."

UCLA Letter – Dated March 19, 2016

- Based on UCLA researchers' findings, they were compelled to advise:
  - LA County Department of Public Health (LACDPH)
  - US EPA
  - SoCalGas
- The UCLA team also advised on the protocol for future indoor testing directed at the LACDPH

"These findings suggest the need for additional indoor testing."

Los Angeles County Department of Public Health

- During Blow Out
  - LACDPH received **700** health related complaints
  - October 28, 2015 to February 18, 2016
  - 16 weeks
  - **Average 44 calls per week**

- Post the SS-25 Repair
  - LACDPH received **150** health related complaints
  - Feb 19 to March 3, 2016
  - 2 weeks
  - **Average 75 calls per week**

Source: http://www.latimes.com/local/lanow/la-me-porter-ranch-oil-slime-closes-park-20160308-story.html

LACDPH Letter to Care Providers – March 8, 2016

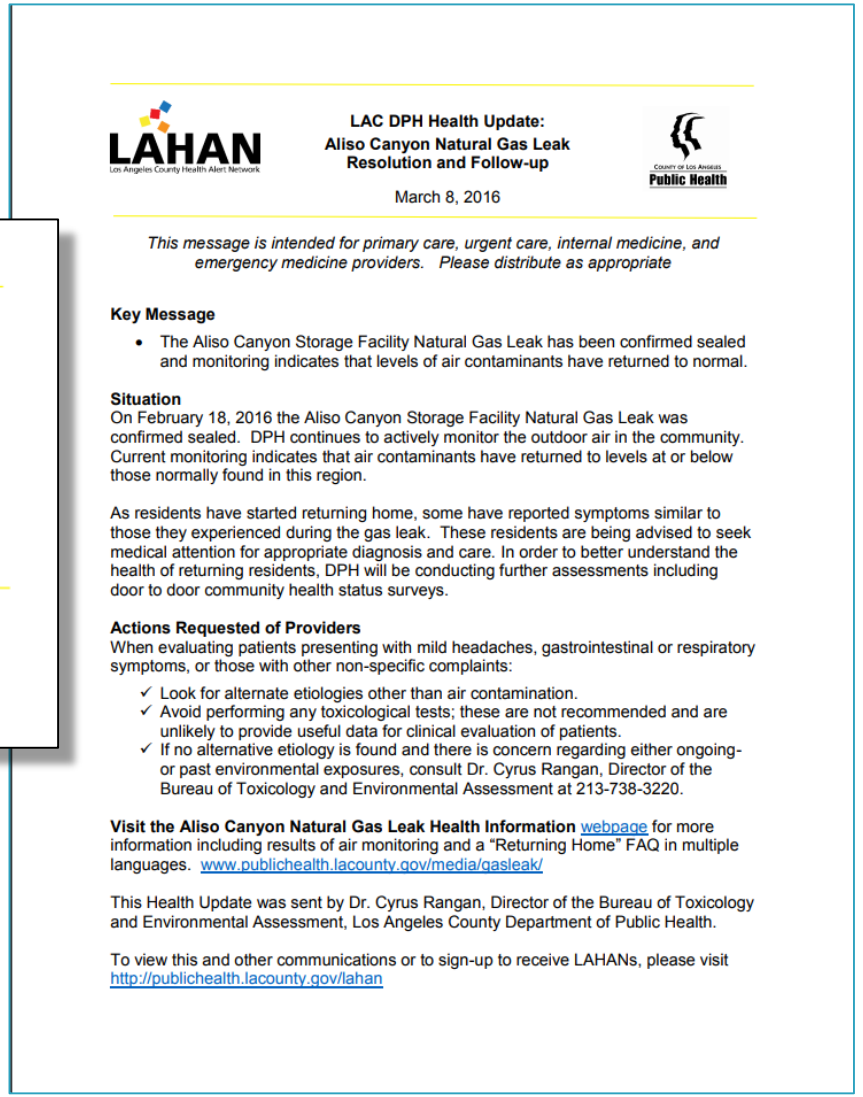
LAHAN
Los Angeles County Health Alert Network

LAC DPH Health Update:
Aliso Canyon Natural Gas Leak Resolution and Follow-up

March 8, 2016

County of Los Angeles Public Health

This message is intended for primary care, urgent care, internal medicine, and emergency medicine providers. Please distribute as appropriate



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LAC DPH Health Update:
Aliso Canyon Natural Gas Leak Resolution and Follow-up

March 8, 2016

County of Los Angeles Public Health

This message is intended for primary care, urgent care, internal medicine, and emergency medicine providers. Please distribute as appropriate

Key Message

- The Aliso Canyon Storage Facility Natural Gas Leak has been confirmed sealed and monitoring indicates that levels of air contaminants have returned to normal.

Situation
On February 18, 2016 the Aliso Canyon Storage Facility Natural Gas Leak was confirmed sealed. DPH continues to actively monitor the outdoor air in the community. Current monitoring indicates that air contaminants have returned to levels at or below those normally found in this region.

As residents have started returning home, some have reported symptoms similar to those they experienced during the gas leak. These residents are being advised to seek medical attention for appropriate diagnosis and care. In order to better understand the health of returning residents, DPH will be conducting further assessments including door to door community health status surveys.

Actions Requested of Providers
When evaluating patients presenting with mild headaches, gastrointestinal or respiratory symptoms, or those with other non-specific complaints:

- ✓ Look for alternate etiologies other than air contamination.
- ✓ Avoid performing any toxicological tests; these are not recommended and are unlikely to provide useful data for clinical evaluation of patients.
- ✓ If no alternative etiology is found and there is concern regarding either ongoing- or past environmental exposures, consult Dr. Cyrus Rangan, Director of the Bureau of Toxicology and Environmental Assessment at 213-738-3220.

Visit the Aliso Canyon Natural Gas Leak Health Information webpage for more information including results of air monitoring and a "Returning Home" FAQ in multiple languages. www.publichealth.lacounty.gov/media/gasleak/

This Health Update was sent by Dr. Cyrus Rangan, Director of the Bureau of Toxicology and Environmental Assessment, Los Angeles County Department of Public Health.

To view this and other communications or to sign-up to receive LAHANs, please visit http://publichealth.lacounty.gov/lahan

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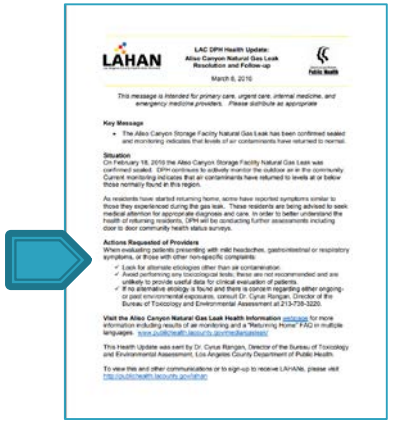

LAHAN

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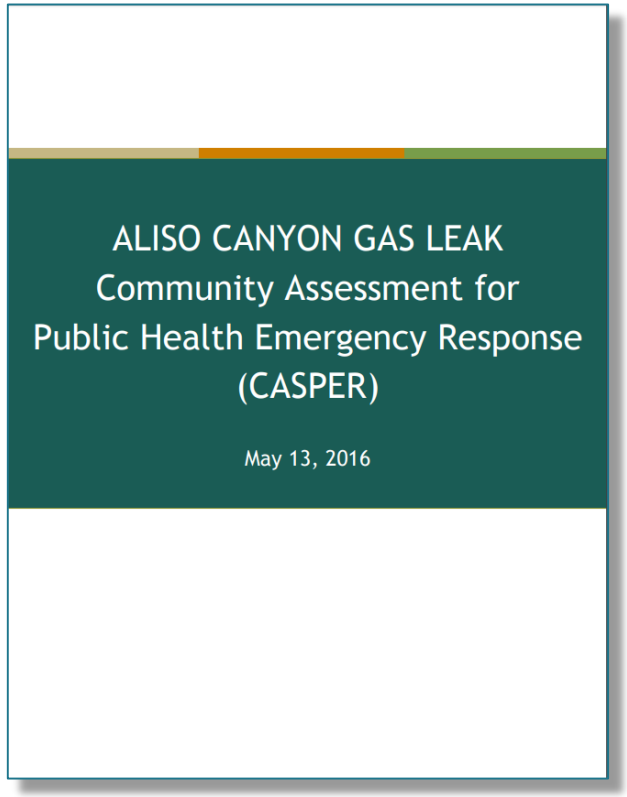
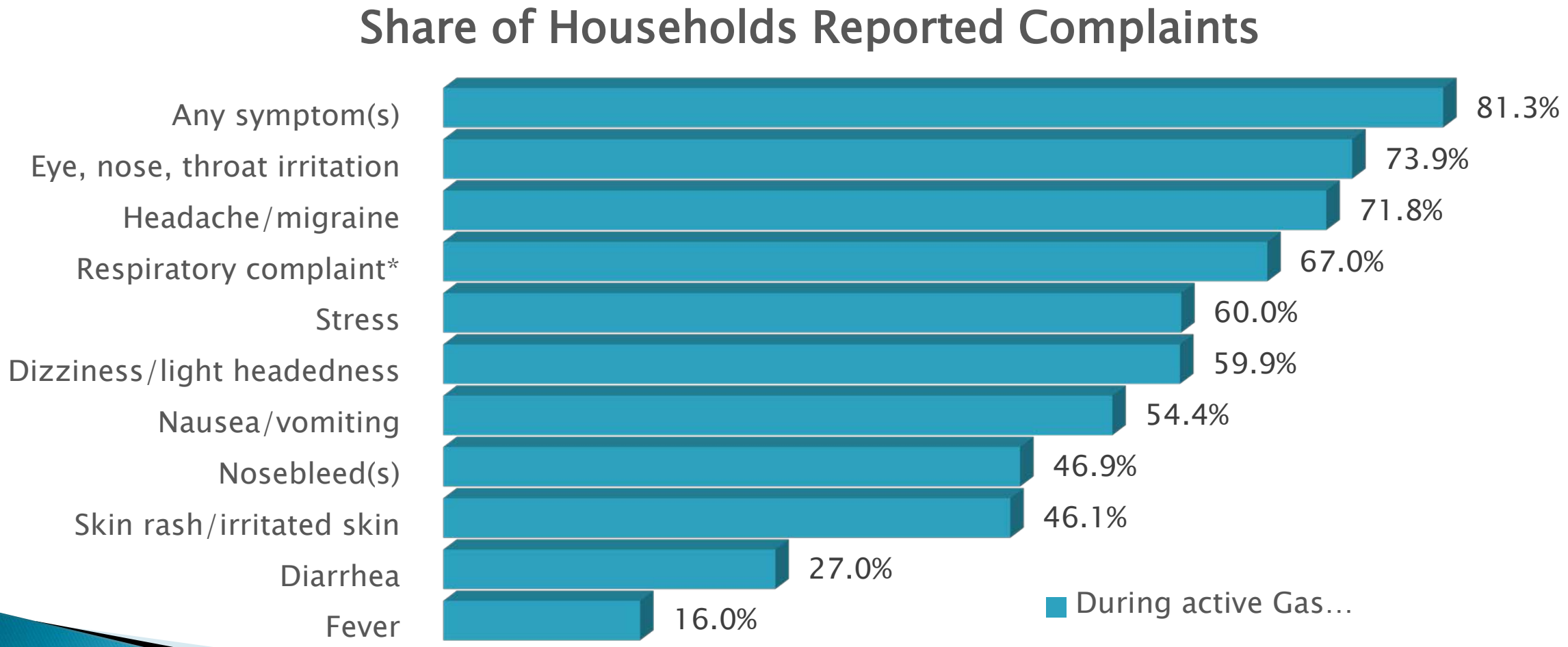
Los Angeles County Department of Public Health

- CASPER (March 10, 11th, 12th)
  - (**C**ommunity **A**ssessment for **P**ublic **H**ealth **E**mergency **R**esponse)
- Door-to-door survey
- 210 households
- 3 mile radius of Well SS- 25
- Conducted – 3 weeks AFTER SS-25 repair
- Is this really an Emergency Response?



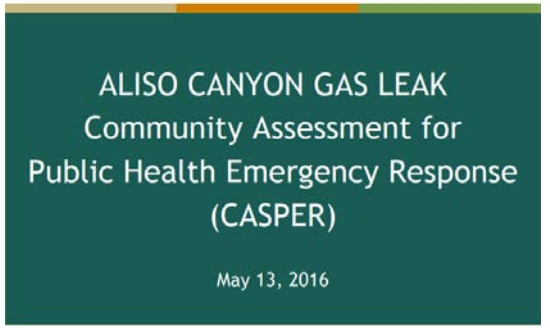
CASPER: As Reported During the Blow Out



CASPER: 2 Weeks After Blow Out Repair

Comments from the Field

…"Several interview staff reported experiencing health symptoms …, including throat irritation and wheezing among interviewers at households closest to the well, and exacerbation of asthma symptoms."
(emphasis added)

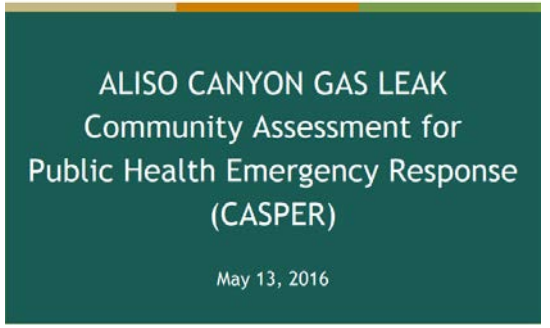


CASPER: 2 Weeks After Blow Out Repair

Comments from the Field

…"Headaches and irritation-type symptoms were also reported among interviewers conducting interviews…"

…"these symptoms improved shortly after the field teams left the sampled homes."…
(emphasis added)



CASPER: 2 Weeks After Blow Out Repair

CASPER Survey also determined:

- 61% get medical care mainly from family doctors and urgent care centers
- 40% of households noticed an oily residue on their personal belongings

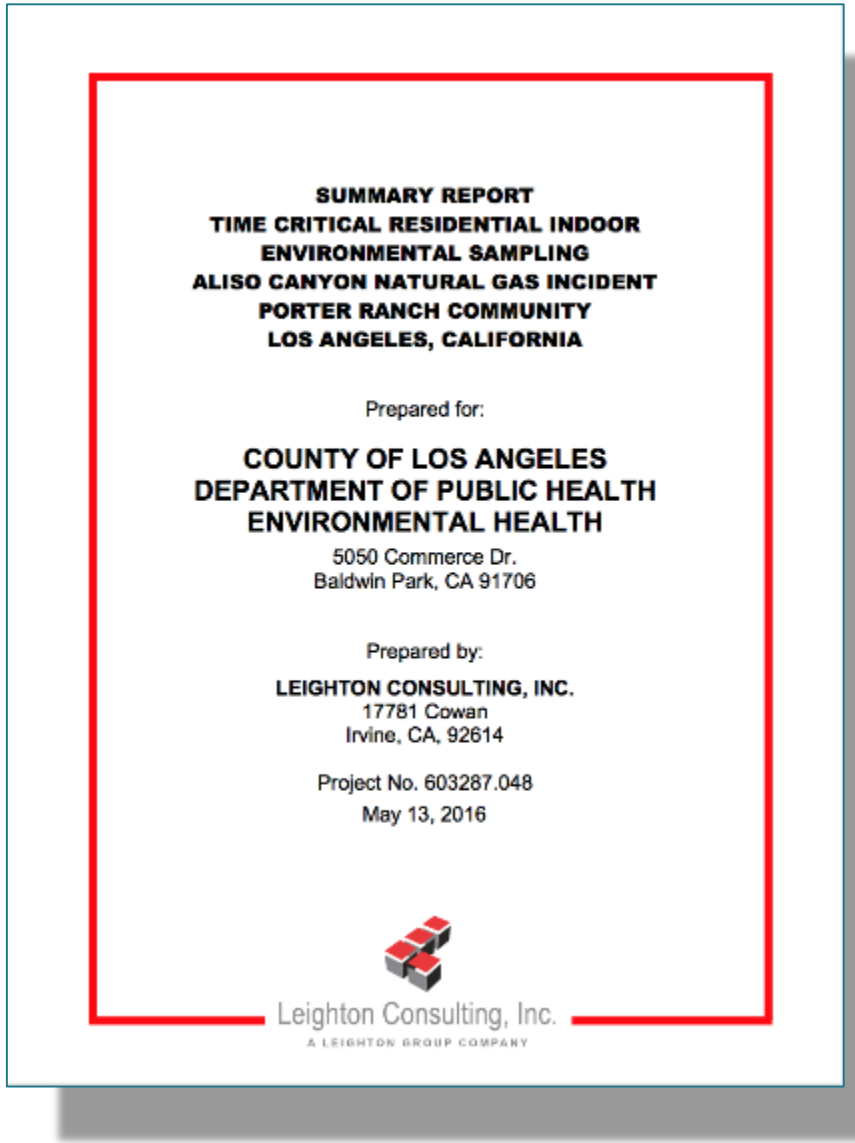
LACDPH Initiates a Study of Area Homes

- LACDPH studies **103 unoccupied, non-smoking** homes within 3 miles of Well Blow Out
- LACDPH studies 11 homes 6 miles SE of Blow Out as controls
  - These homes were **occupied to the best of my knowledge**
- LACDPH knows of UCLA's March 10, 2017 findings: **28.6%** (2 of 7) homes positive for **Benzene** and **Hexane** on the wipes from counter tops

LACDPH consults with state and federal agencies and hires Leighton Consulting, including:

Leighton Study - Published May 13, 2016

- Surveyed 114 Homes
- Tested Numerous Chemicals
- 4,700 pages
- What did this COST???



SUMMARY REPORT
TIME CRITICAL RESIDENTIAL INDOOR
ENVIRONMENTAL SAMPLING
ALISO CANYON NATURAL GAS INCIDENT
PORTER RANCH COMMUNITY
LOS ANGELES, CALIFORNIA

Prepared for:

COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC HEALTH
ENVIRONMENTAL HEALTH
5050 Commerce Dr.
Baldwin Park, CA 91706

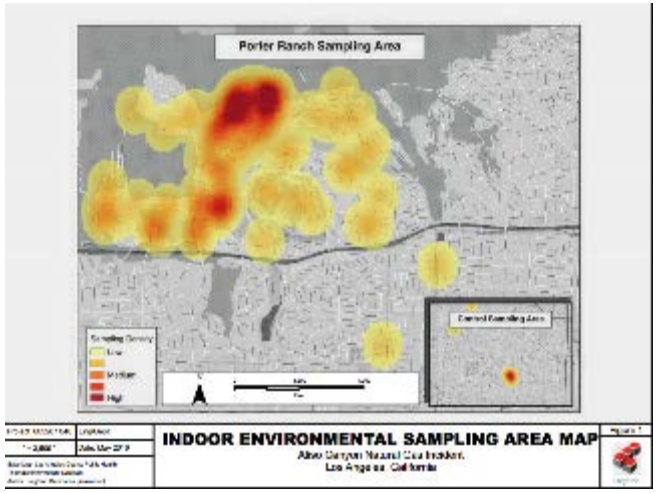
Prepared by:

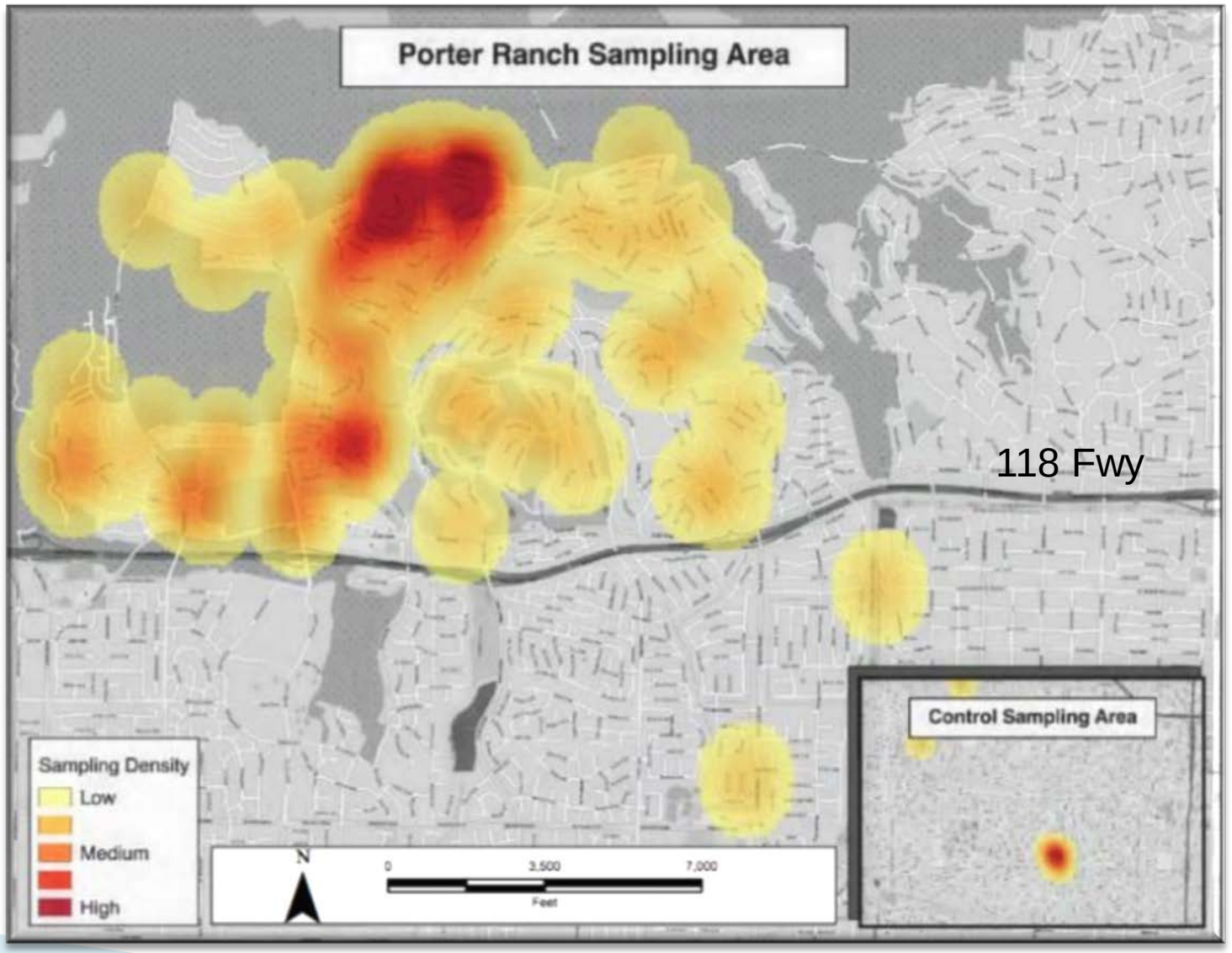
LEIGHTON CONSULTING, INC.
17781 Cowan
Irvine, CA, 92614

Project No. 603287.048
May 13, 2016

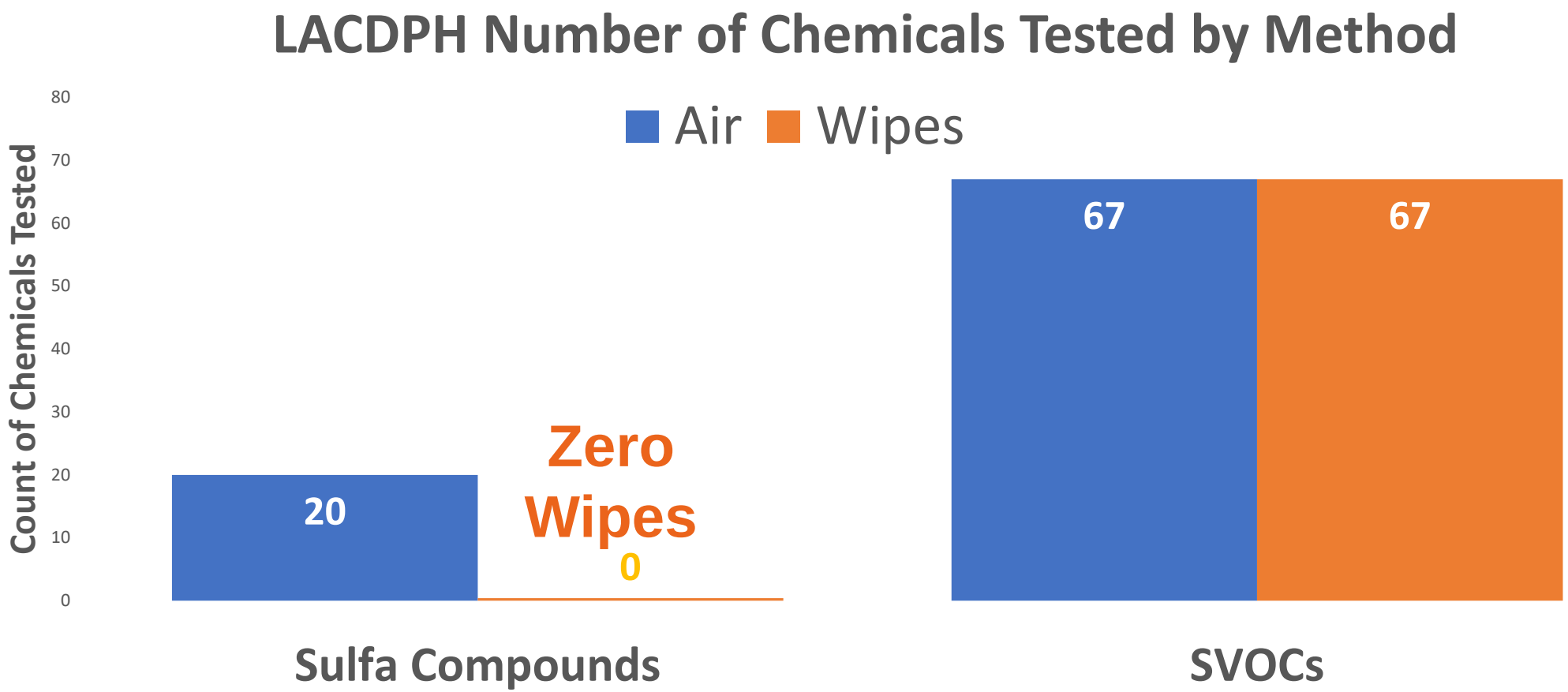
Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Leighton Study – Sampling Area





What did LACDPH test for…and What they Didn't



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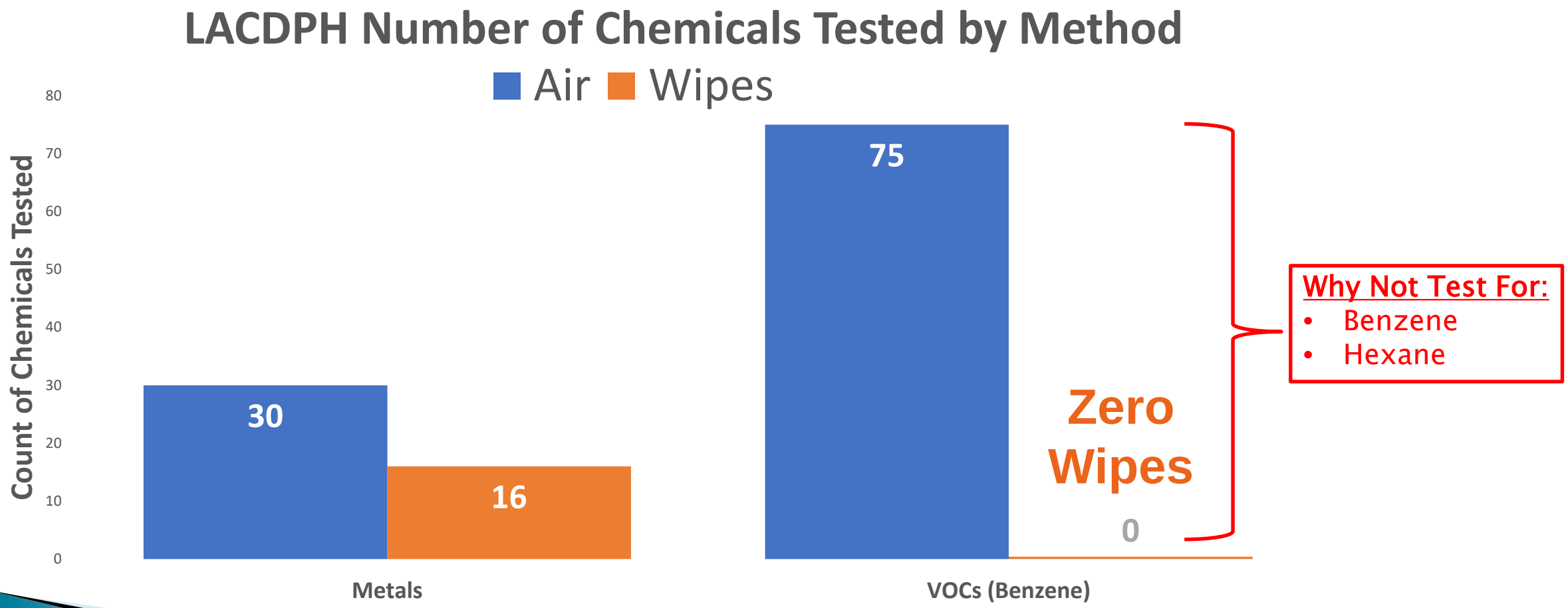


What did LACDPH test for…and What they Didn't

- No VOCs tested in wipes
  - Benzene – "molecule of concern" known carcinogen
  - Why? – because its volatile
  - Despite LACDPH found Benzene in the AIR canisters

- Despite that UCLA **found Benzene in the wipes!**

Benzene

- World Health Organization states no safe level of exposure!

Benzene – So What is a Positive?

OEHHA* Acute, 8-hour and Chronic Reference Exposure Level (REL) Summary

Benzene (71-43-2)	**A**	27		Developmental; Immune system; Hematologic system
	8	3		Hematologic system
	C	3		Hematologic system

A=Acute Exposure
8=8 hour Exposure (work day)
C=Chronic Exposure

*Office of Environmental Health Hazard Assessment (OEHHA)

How Does this Impact your Children?

- Has any agency dosed toxins on a per kilogram body weight?

  No!

- So, does this directly impacts children?

  Yes!

LACDPH/Leighton Findings in Air Samples

- Testing in Late March to Early April 2016
- Benzene – found levels >3 in 6 of 103 (or 5.8%) Test Homes
- Also 1 of 11 (or 9%) Control Homes tested positive for Benzene
  - Were these homes 6+ miles away impacted?

Causing: Multiple Myeloma, Aplastic Anemia, Leukemia, etc.

Benzene Found in Air at High Risk Levels

- Benzene was found in homes by LACDPH during sample testing
- A **CONTROL** home had a level of **5.8, nearly 2 times greater** than what the OEHHA considers safe for chronic exposure of 3

Actual Test Results

Table 4a: Air Samples, Volatile Organic Compounds (VOCs)

Analytical Method: EPA TO-15; Units: micrograms per cubic meter ($\mu g/m^3$)

Results file number	P1601737	P1601691	P1601737	P1601830	P1601830	P1601740
Location	Control	Control	Control	Control	Control	Control
Date Sampled	4/1/2016	3/30/2016	4/1/2016	4/5/2016	4/5/2016	4/1/2016
Acrolein	**7.8**	< 3.8	**4.1 J**	**2.7**	**3.6 J**	**2 J**
Acrylonitrile	< 0.93	< 0.96	< 1.1	< 0.62	< 1.1	< 1
alpha-Pinene	**1.7**	< 0.96	**9.7**	**8.5**	**7.5**	**2.2**
Benzene	**2.2**	**0.67**	**1.5**	**1.2**	**1.5**	**5.8**
Benzyl Chloride	< 0.93	< 0.96	< 1.1	< 0.62	< 1.1	< 1

Benzene Found in Air at High Risk Levels

- Benzene was found in homes by LACDPH during sample testing
- A **TEST** home had a level of **29, nearly 10 times greater** than what the OEHHA considers safe for chronic exposure of 3

Actual Test Results

Table 4a: Air Samples, Volatile Organic Compounds (VOCs)

Analytical Method: EPA TO-15; Units: micrograms per cubic meter ($\mu g/m^3$)

Results file number	P1601830	P1601738	P1601668	P1601690	P1601738	P1601691
Location	Residence	Residence	Residence	Residence	Residence	Residence
Date Sampled	4/5/2016	4/1/2016	3/29/2016	3/30/2016	4/1/2016	3/30/2016
Acrolein	**2.7 J**	**1.2 J**	< 2.9	**1.2 J**	**2 J**	< 4.4
Acrylonitrile	< 1.6	< 0.63	< 0.73	< 0.71	< 0.86	< 1.1
alpha-Pinene	**1.2 J**	**6.5**	< 0.73	**0.7 J**	**10**	< 1.1
Benzene	**2.2**	**0.49**	**0.25**	**1.1**	**29**	**0.29**
Benzyl Chloride	< 1.6	< 0.63	< 0.73	< 0.71	< 0.86	< 1.1

What did LACDPH test for … and What they Didn't

- 16 Metals in wipes
  - No testing for Uranium or Lithium
- 30 Metals in air
  - No metals were detected including Uranium or Lithium
- Why the 16 vs 30?

LACDPH's Report to Homeowners – May 31, 2016

…"As described in the summary report, the majority of the priority chemicals of concern, including benzene, polycyclic aromatic hydrocarbons (commonly known as black soot), and sulfur compounds, were not found to be elevated in the air or dust in Porter Ranch area homes."…

(emphasis added)


O CANYON GAS LEAK DISASTER

Indoor Environmental Testing Protocol Results for Your Home

May 31, 2016

Dear Resident,

Thank you for volunteering to participate in the Los Angeles County Department of Public Health (DPH) Indoor Environmental Testing Protocol in the Porter Ranch area. This letter includes: 1) a summary of findings from the indoor environmental sampling program, 2) a summary table of results for your home (titled "Your Home Summary"), and 3) recommended next steps for residents— "Returning Home after Indoor Environmental Testing."

The summary report of findings considers the overall results from all the homes included in the indoor environmental sampling program. The laboratory data from all the homes taken together was used to evaluate the types, levels, and ranges of chemicals found in the homes and whether they indicated a common outdoor source of contamination. As described in the summary report, the majority of the priority chemicals of concern, including benzene, polycyclic aromatic hydrocarbons (commonly known as black soot), and sulfur compounds, were not found to be elevated in the air or dust in Porter Ranch area homes. Overall, levels of indoor air contaminants in Porter Ranch area homes were similar to those found in comparison homes located 6 miles away from Well SS-25.

Further analysis of household dust samples revealed a characteristic "fingerprint" of metals that indicated a common source. There is also evidence that metals were emitted during the leak and now have been distributed into the homes of residents. While the levels of these metals are low and do not pose a long-term health risk, they could be responsible for the short-term symptoms being experienced by Porter Ranch residents.

The attached results table provides the levels of chemicals detected in household dust samples and air samples taken from your home, as compared to levels detected in homes located 6 miles away from Well SS-25. Please take some time to review the report and feel free to contact us to help you understand what it says, to go over your report with you, or to answer any questions that you may have.

DPH recommends that all homes that participated in the indoor environmental sampling program follow the enclosed step-by-step guide for cleaning and airing out your home to minimize the potential for exposure to contaminants that may have entered homes. DPH has issued a directive to Southern California Gas Company to offer and implement, at its own cost, the comprehensive cleaning protocol provided in the summary report of findings.

Thank you again for your participation in the indoor environmental sampling program. For the latest information, please visit our website: www.publichealth.lacounty.gov/media/lascas. For questions and assistance in understanding the reports, please contact us at (213) 738-3220 or mbane@ph.lacounty.gov.

Los Angeles County Department of Public Health
www.publichealth.lacounty.gov

Other Chemicals of My Concern

- Acrolein
- Dichloromethane (DCM)

Acrolein – So What is a Positive?

OEHHA* Acute, 8-hour and Chronic Reference Exposure Level (REL) Summary

Acrolein (107-02-8)	**A**	2.5[5]		Eyes, respiratory system (sensory irritation)
	8	0.7[5]		Respiratory system
	C	0.35[5]		Respiratory system

A=Acute Exposure
8=8 hour Exposure (work day)
C=Chronic Exposure

*Office of Environmental Health Hazard Assessment (OEHHA)

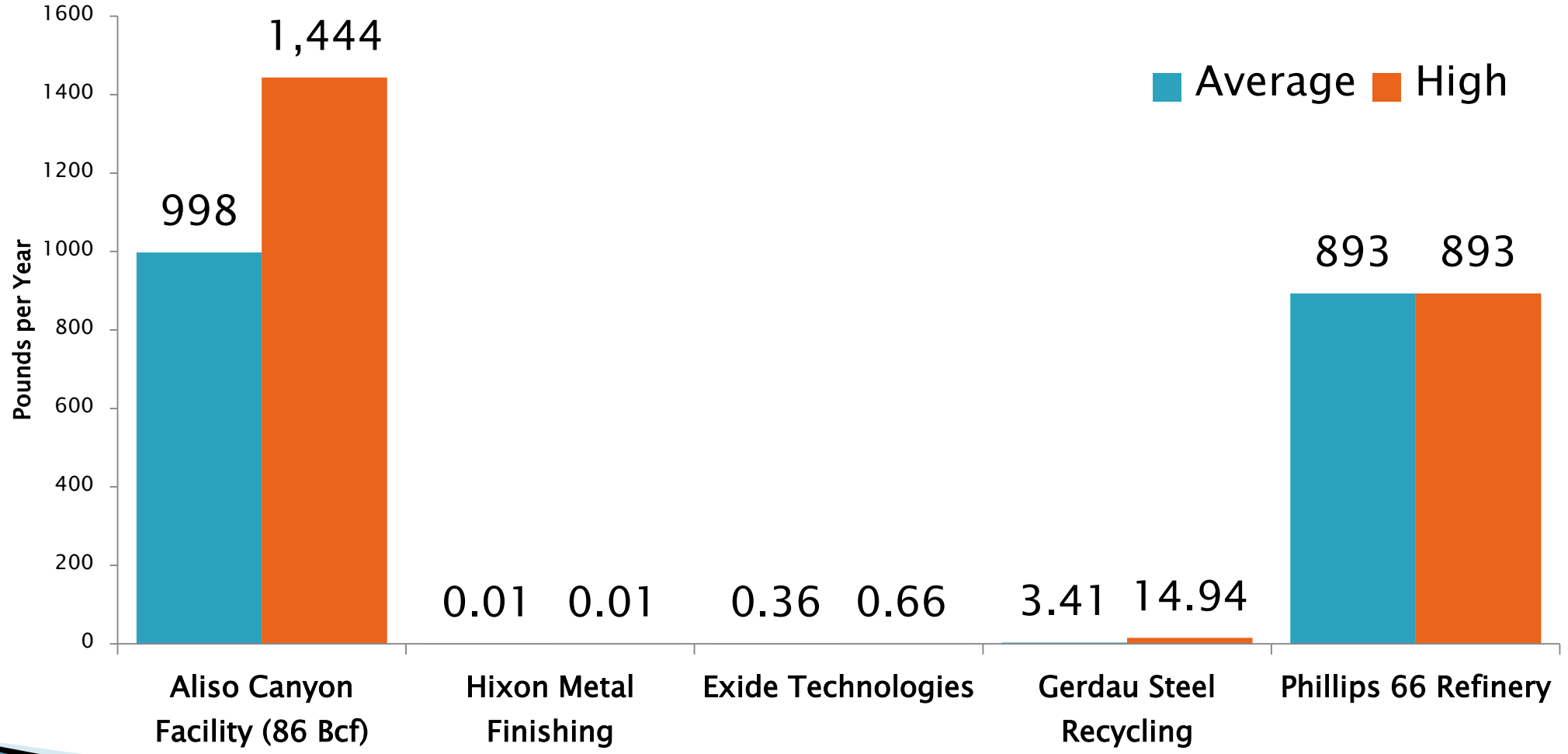
Acrolein Stats – Leighton Study

- **96% of 103 Test homes were positive for Acrolein,** with levels greater than 0.35
- **100% of 11 Control homes** had Acrolein levels greater than 0.35
- **83% of Schools tested** (5 of 6) had Acrolein levels greater than 0.35

Acrolein

- Propene is a **byproduct of oil refining and natural gas processing**
- C_3H_6 (propene) + O_2 (air) → C_3H_4O (acrolein) + H_2O (water)
- Acrolein is released from tobacco

Aliso Canyon History of Acrolein Release
(2000-2014 compared to 4 other companies in this air district)



* Phillips 66 only reported one year, 2015

Acrolein

- Acrolein is toxic and is a strong **irritant for the skin**, **eyes**, and **nasal passages**
- Acrolein is associated with an **increased risk of lung cancer**
- Hemorrhagic cystitis – **blood in urine**

Acrolein – LACDPH's Report to Homeowner

SAMPL

Your Home Summary

Household Dust: We tested the dust collected from your home for 84 chemicals, and none of these chemicals were detected in the sample collected from your home.

Indoor Air: We tested the indoor air collected from your home for 189 chemicals. There were 44 chemicals detected in the sample collected from your home.

- All 44 chemicals that were detected were within the range observed in comparison homes.
- All 44 chemicals that were detected were below the California Environmental Protection Agency (EPA) Reference Levels, except for two chemicals – acrolein and benzene (shaded in yellow below). The Reference Levels are designed to address long-term exposures (up to a lifetime) in a residential setting and are protective of sensitive populations such as children.
- We recommend follow-up evaluation and testing of the indoor air in your home.

Acrolein – LACDPH's Report to Homeowner

Resident

Los Angeles County Department of Public Health Indoor Air Results

Table 1: Indoor Air Results (µg/m^3)

Chemicals	Your Home Results (4/1/16)	Your Home Results (6/23/16)	Indoor Air** Range (Min – Max)	Outdoor Air in Porter Ranch† Average	California EPA Health Reference Level‡
acetonitrile	Not Detected	0.5*	0.3 – 1.0	0.45	
acrolein	2.2*	4.7	1.9 - 7.8	1.6	0.35
alpha-pinene	1.4	3.9	0.48 - 9.7	0.49	NA

Acrolein – LACDPH's Report to Homeowner

On June 23, 2016, we followed up with a second round of indoor air testing for volatile organic compounds. Benzene was detected at 0.8 µg/m^3, which is typical for the indoor home environment and below the California EPA Reference Level. Acrolein was detected at 4.7 µg/m^3, and recent study of non-smoking residential homes in California reported indoor concentrations of acrolein ranged from 2.1 to 12.2 µg/m^3.[1] No further testing is necessary.

---

[1] Seaman VY, Bennett DH and Cahill TM. Origin, Occurrence, and Source Emission Rate of Acrolein in Residential Indoor Air. Environmental Science & Technology. 2007. Oct 15;41(20):6940-6.

Dichloromethane or DCM

- Majority of dichloromethane in the environment is the result of industrial emissions
- Paths to Internalization: Inhalation and absorption through skin
- DCM is also metabolized by the body to carbon monoxide potentially leading to carbon monoxide poisoning

Dichloromethane or DCM

- **Symptoms of acute overexposure via inhalation include:**
  - Difficulty Concentrating
  - Dizziness
  - Fatigue
  - Nausea
  - Headaches
  - Numbness
  - Weakness
  - Irritation of the upper respiratory tract and eyes

Dichloromethane or DCM

- It may be **carcinogenic**, as it has been linked to cancer of the lungs, liver, and pancreas in laboratory animals
- Other animal studies showed breast cancer and **salivary gland cancer**
- In people with pre-existing heart problems, exposure to DCM can cause **abnormal heart rhythms and/or heart attacks**, sometimes without any other symptoms of overexposure

DCM - LACDPH's Report to Home Owner

- Air samples within a resident's home found Dichloromethane levels of 560 – 40% beyond CalEPA HRL of 400
- Control Homes upper range also exceeds CalEPA (13-**560**)

Table 1: Indoor Air Results (µg/m³)

Chemicals	Your Home Results	Indoor Air** Range (Min – Max)	Outdoor Air in Porter Ranch† Average	California EPA Health Reference Level‡
dichloromethane (methylene chloride)	560	13 - 560	3.6	400

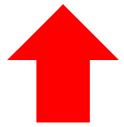
LACDPH/Leighton – Report Results

- Air samples within a resident's home found Dichloromethane levels of 860, **over 2-times greater** than CalEPA levels of 400

Table 4a: Air Samples, Volatile Organic Compounds (VOCs)

Analytical Method: EPA TO-15; Units: micrograms per cubic meter ($\mu g/m^3$)

Results file number	P1601832	P1601832	P1601665	P1601844	P1601690	P1601844
Location	Residence	Residence	Residence	Residence	Residence	Residence
Date Sampled	4/5/2016	4/8/2016	3/29/2016	4/6/2016	3/30/2016	4/6/2016
Dibromochloromethane	< 0.22	**0.37**	**0.16**	< 0.22	< 0.21	< 0.22
Dichlorodifluoromethane (CFC 12)	**2.2**	**2.5**	**2.1**	**4.7**	**1.6**	**1.9**
Dichloromethane (Methylene Chloride)	**21**	**82**	**860 D**	**58**	**14**	**160**



As a treating physician, I am concern and wonder if these were disclosed to the homeowner’s?

Water Testing

Section 5

What's in the Water?

- Hair samples positive for high levels of **Uranium** and **Lithium**
- To narrow down the potential sources of lithium, I decided to look at the water

What's in the Water?

- Weck Laboratories, Inc. - City of Industry, CA
  - Qualified lab for water testing
  - Chose local lab for quick response
- Tested for Uranium and Lithium

WECK LABORATORIES, INC.

CALIFORNIA Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

CALIFORNIA STATE
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

CERTIFICATE OF ENVIRONMENTAL ACCREDITATION

Is hereby granted to

Weck Laboratories, Inc.

14859 East Clark Avenue
City of Industry, CA 91745

Scope of the certificate is limited to the "Fields of Testing" which accompany this Certificate.

Continued accredited status depends on successful completion of on-site inspection, proficiency testing studies, and payment of applicable fees.

This Certificate is granted in accordance with provisions of Section 100825, et seq. of the Health and Safety Code.

Certificate No.: **1132**
Expiration Date: **3/31/2018**
Effective Date: **4/1/2016**

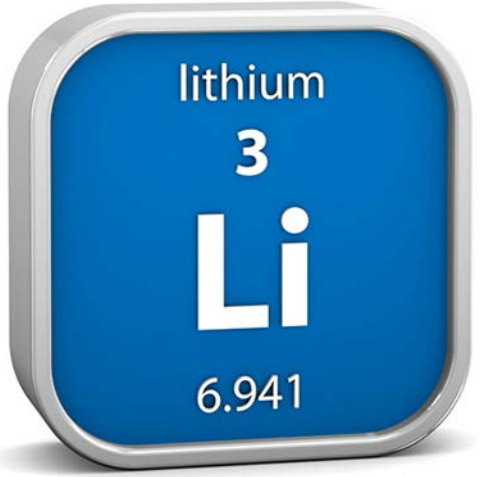
Sacramento, California
subject to forfeiture or revocation

Christine Sotelo, Chief
Environmental Laboratory Accreditation Program

What are Normal Levels for Drinking Water?

- **Uranium:** 1.3 – 20.0 pCi/L
  - A measurement of radiation
  - EPA's maximum contaminant level is 30

- **Lithium:** 10 to **?** microgram/L
  - EPA has no established upper limit of normal



Findings – Uranium Levels (pCi/L)

25 LADWP Households Tested		
Area	**N-samples**	**Uranium**
Porter Ranch	6	1.4-2.6
Chatsworth	3	1.3-2.6
Granada Hills	5	1.3-2.3
Lake Balboa	1	2.4
Los Angeles	3	1.6-2.2
Venice Beach	1	2.1
Northridge	1	2.0
Encino	2	1.2-2.1
Tarzana	1	0.86
Woodland Hills	1	1.9
Winnetka	1	1.5
Average		**1.77**
Median		**1.7**

6 Non-LADWP Households Tested		
Area	**N-samples**	**Uranium**
Camarillo	1	0.22
Oak Park	1	0.72
Santa Clarita	1	0.94
Simi Valley	1	0.83
South Pasadena	1	1.5
Westlake Village	1	0.95
Average		**0.86**
Median		**0.89**

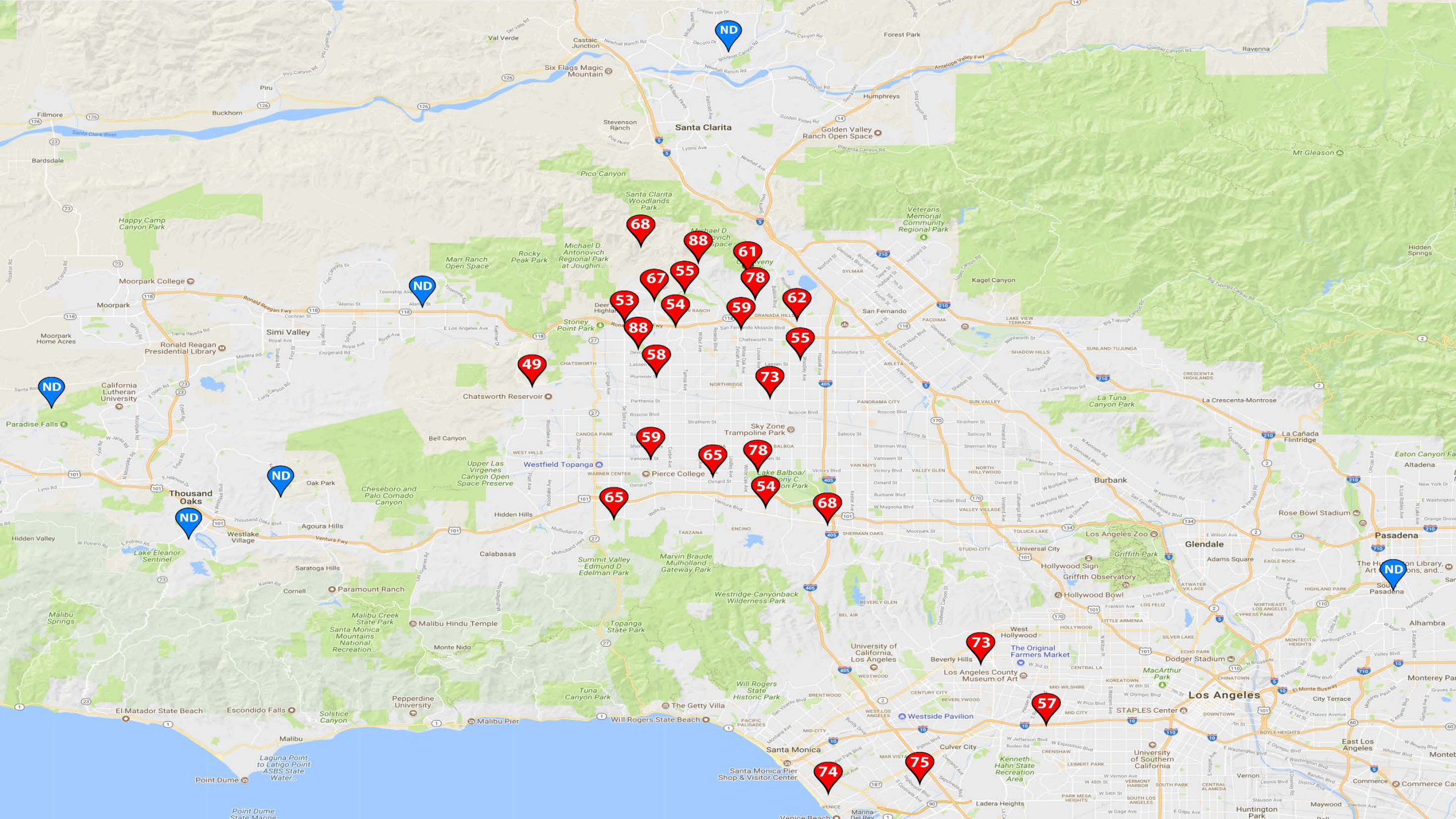
ND=Non-Detectible

Findings – Lithium Levels (micrograms/L)

25 LADWP Households Tested		
Area	**N-samples**	**Lithium**
Porter Ranch	6	54-88
Chatsworth	3	49-88
Granada Hills	5	55-78
Lake Balboa	1	78
Los Angeles	3	57-75
Venice Beach	1	74
Northridge	1	73
Encino	2	54-68
Tarzana	1	65
Woodland Hills	1	65
Winnetka	1	59
Average		**65.4**
Median		**65**

6 Non-LADWP Households Tested		
Area	**N-samples**	**Lithium**
Camarillo	1	ND
Oak Park	1	ND
Santa Clarita	1	ND
Simi Valley	1	ND
South Pasadena	1	ND
Westlake Village	1	ND
Average		**ND**
Median		**ND**

ND=Non-Detectible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Lithium and Dementia Study – Denmark Aug 2017

New Scientist

HOME NEWS TECHNOLOGY SPACE PHYSICS HEALTH EARTH HUMANS LIFE TOPICS EVENTS JOBS

THE QUANTUM REVOLUTION MASTERCLASS – this Saturday in London – last chance to buy tickets

Home | News | Health

SHORT SHARP SCIENCE 23 August 2017

Lithium in tap water seems to both raise and lower dementia risk

How much lithium?
Lucy Lambriex/Getty

Lithium and Dementia Study – Denmark Aug 2017

- Lars Vedel Kessing & team from University of Copenhagen
- Tested water samples from 151 waterworks in Denmark
- Measured lithium levels of drinking water for:
  - 733,000 healthy people
  - 74,000 people with dementia
- Their findings were surprising

Lithium and Dementia Study – Denmark Aug 2017

Lithium Exposure	Range (micrograms/L)	Dementia Risk Relative to Low Exposure
High	15.0+	Decreased by 17%
Medium	5.1 to 10	Increased by 22%
Low	2.0 to 5.0	Baseline

Average LADWP Lithium Level = 65.4

Lithium and Dementia Study – Denmark Aug 2017

- *"…"In high doses, or even at low doses in some people, lithium can be toxic, so it is important that people consult with their doctor before they consider taking it as a supplement," **says James Pickett, of the Alzheimer's Society charity**…."*

Conclusion

Section 6

Conclusion

- **SS-25 Gas Well Blow Out exposed the community to toxins of unprecedented**
  - Quantity
  - Duration
  - Combination
- **Many people became ill and continue to suffer today**

Conclusion

- Toxicology reports a **statistically significant difference** in regards to the levels of **Styrene, Ethylbenzene (BTEX)**, **Uranium** and **Lithium**
- It was demonstrated in the urine & hair samples of the tested residents when compared to the rest of California as well as the United States
- Positive toxicology within hair samples at various lengths supports **long-term exposure**

Conclusion

- In 26 homes, Lithium was detected in LADWP water supply
- Conversely, non-LADWP water reported non-detectible levels of Lithium
- **We do not know the source, or the duration of presence, of the Lithium in the LADWP drinking water**

Conclusion

- **We clearly do not know the health impact of the Lithium at this time and needs further investigation**
- There is an abundance of information to strongly support the need for a **comprehensive**, **<u>independent</u>**, **long-term health study** from **toxin exposures of SS-25 well Blow Out**

Conclusion

Otherwise, it is scientifically irresponsible to ignore the facts and allow the continued operation of Aliso Canyon Gas Storage Field

Q&A

Section 7

Q&A

- Please limit your questions or comments to 2 mins

THANK YOU
THIS ENDS OUR PRESENTATOIN