

Chromium-6, Strontium-90, and Tritium Levels in the Drinking and Groundwater of Southern California Cities

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ABSTRACT

•This experiment exposes the reality of how contaminated our groundwater is because of industry and nuclear energy bi-products. This study is the analysis of environmental water samples from four different cities in Southern California; Simi Valley, CA, Thousand Oaks, CA, Oak Park, CA, and Westlake, CA. Three 10 mL water samples will be taken from similar ecosystems in each city (total of 12 samples) and tested for a carcinogen and two radionuclides. The water samples will be tested for hexavalent chromium (a carcinogen) strontium-90 (a radioactive form of strontium) and tritium (a radioactive isotope). Each of these substances has made its way into our groundwater through industrial pathways. As industry continues to grow this toxic chemical pollution of our groundwater will in turn continue to grow, and thus creating more of a health threats to the surrounding citizens.

INTRODUCTION

Metalloids and other chemicals like those in this study are present in our ecosystem as a result of global industry and various factories. Pollution, especially carcinogenic or radioactive pollution, will continue to grow if not properly addressed. Hexavalent chromium, strontium-90, and tritium are all harmful to human health and are unfortunately all hypothesized to be present in the water supply of the alleged California cities.

Hexavalent chromium or chromium-6 is the element chromium with an added 6+ oxidation state. Hexavalent chromium is created during welding or melting of chromium. Chromium is naturally not hexavalent, but when high temperatures are present an oxidation is attached to the chromium ion. Although hexavalent chromium poses a clear threat in this project, chromium itself is not all bad. Chromium pollinate is a nutritional supplement that helps type 2 diabetics with weight loss and blood sugar regulation. It helps to lower one's cholesterol, as well as assists with growth performance (source 2). According to an Material Safety Data Sheet (MSDS) when hexavalent chromium is ingested it causes many health concerns involving the respiratory tract, stomach, small intestine, and the male reproductive system. In the respiratory tract exposure to hexavalent chromium can cause nasal irritation, breathing issues like asthma, and severe allergies to further chromium compounds. A stomach or small intestine subject to hexavalent chromium results in stomach irritation, ulcers, and anemia.

When found in nature, strontium is a soft metal found most commonly in rocks, when found in this state it is generally called stable strontium, and it is not radioactive or unstable when in this natural state (Source 5). Strontium-90, however, is the radioactive form of the element and is created during a nuclear explosion within its reactors. Sr90 also has a half-life of 29 years and is generally found within nuclear reactors in nuclear power facilities.

Tritium has a half-life of 250 years and is extremely toxic to humans. It is the fastest radionuclide in water, is very difficult to

MATERIALS AND METHODS

Materials

Liquid Scintillation counter, Location tracker, zip lock bags, rubber gloves, plastic containers, 0.2 micron filter, fume hood, hotplate, burette, analytical balance, tin foil, 10 ml syringe, water samples, 10 ml falcon tubes, hatch chromium testing kit.

Methods

Part 1:

Obtain syringe, latex gloves, 16 plastic containers. I gathered water samples in all 4 locations must have similar environmental aspects (Simi Creek, Conejo Creek, Medea Creek, Lindero Creek) In order to collect water samples a 10 ml syringe was used to transfer 10 ml of liquid from ground into plastic containers, then each container was labeled with date, time and location. Each location where samples were taken are recorded using a location tracker app on smartphone. Control water samples will be taken in the city of Thousand Oaks because it is in the general center of the other 3 cities. All samples were taken back to lab for preparation and analysis. All observations environmental and otherwise are recorded in prep notebook.

Part 2:

Water samples will need to be prepared for liquid scintillation counter and chromium test strips. Every sample will be filtered with a 0.2 micron filter and measured to 10 ml inside a 10 ml falcon tube.

Part 3:

Scintillation Counter Method:

This is a method that will be used in the lab of a University by a professor or advisor and assisted by myself. Eight water samples will be sent to laboratory.

Pipette 2 mL of sample into 20 mL scintillation vial¹

Add 10mL of scintillation fluid², cap vial, and agitate. Label and rack vials.

Liquid scintillation assay w/LSC3

Assay protocol: 3 min count on 3 channels

0.14.5 KeV

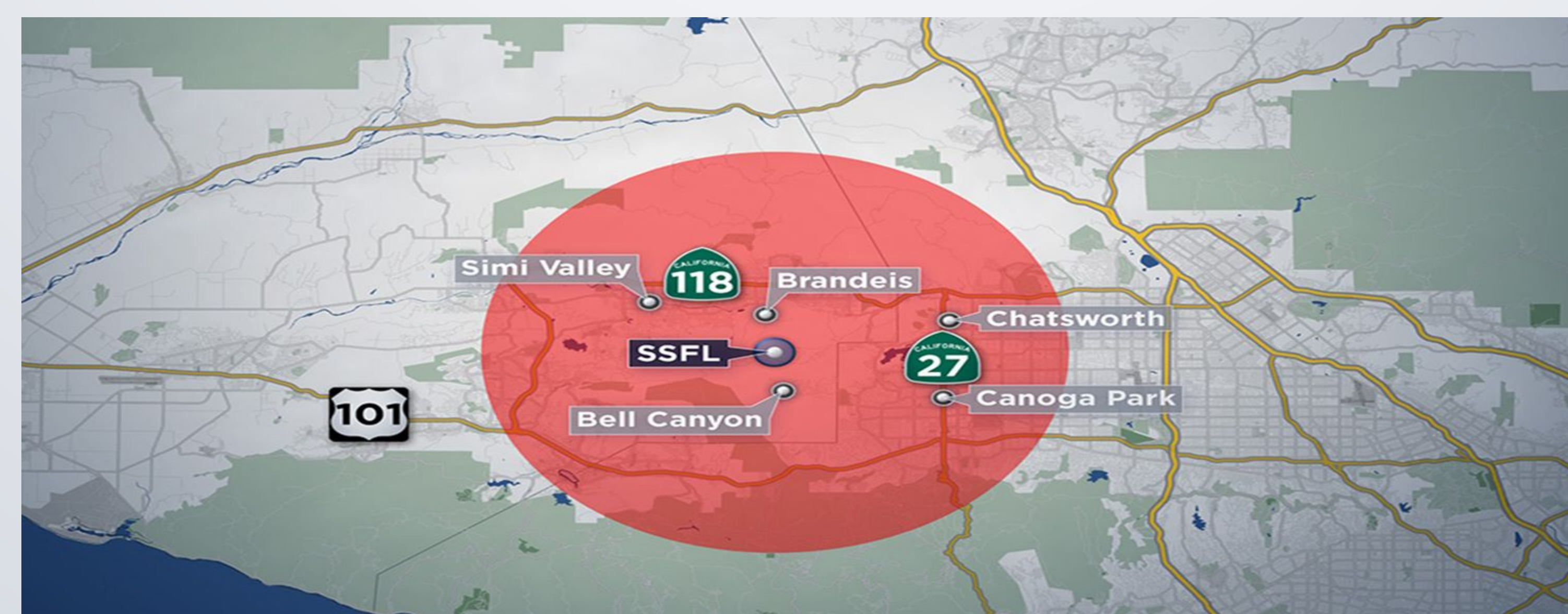
0-133.4 KeV

0-2000 KeV

1Perkin Elmer Cat. 6013329

2Research Products International Cat. 7400S-11

3Beckman LS 6500, S/N 7069723



Hypothesis

From all of the gathered substances there will be large, harmful amounts of Hexavalent Chromium, Strontium-90, and Tritium in the water samples collected in the Simi Valley, Oak Park, Westlake, and Thousand Oaks areas.

Safety

Some potential safety concerns that could threaten this experiment include the following; the fact that I am dealing with possibly radioactive substances poses a very dangerous medical threat to myself and those around me. Also, Liquid Scintillation is a difficult process that must be conducted with precision and attention to ensure maximum safety and results.

RESULTS

•TBD”.



Your caption can go here.

ADDITIONAL INFORMATION

Work will be done in room E8 at Thousand Oaks High School (2323 N Moorpark Rd, Thousand Oaks, CA 91320) supervised by Dr. Bhupinder Malhotra, Jeffrey Lewis, and Amgen researcher Dr. William Goodman. Also samples will be sent to UCLA's Liquid Scintillation Counter (405 Hilgard Avenue, Los Angeles, CA 90095) supervised by UCLA Radiation Safety Officer, Bryan Ruiz.

REFERENCES

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- (2)Hamidi, O., Chamani, M., Ghahri, H., Sadeghi, A. A., & Malekinejad, H. (2016). Effects of chromium(III) Picolinate and chromium(III) Picolinate Nanoparticles Supplementation on Growth Performance, Organs Weight and Immune Function in Cyclic Heat Stressed Broiler Chickens. Kafkas Universitesi Veteriner Fakultesi Dergisi Kafkas Univ Vet Fak Derg. doi:10.9775/kvfd.2015.14736
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