CHIME Study: Community Health Impacts from Mining Exposure
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Community of Abandoned Mines:
Citizens from Nevada City and Grass Valley, California have expressed a desire to know whether human health is adversely affected from living in Gold Country. Since recent concerns among residents have emerged, Sierra Streams Institute along with the Cancer Prevention Institute of California (CPIC), have undertaken a pilot research project to investigate the high levels of cadmium (Cd) and arsenic (As) in abandoned mine sites and explore possible links to higher than normal rates of breast cancer in the Gold Country area. Hundreds of abandoned gold mines remain in the Gold Country region, leaving behind toxic pits, acid mine drainage, and vast piles of mine waste containing high levels of these metals. These wastes remain in soils, trails, roads, and yards near residential, recreational, and commercial areas throughout Gold Country.

Cadmium and Arsenic:
It has been observed that both cadmium and arsenic are metalloestrogens, endocrine-disruptors that have a tendency to imitate estrogen and target alpha estrogen receptors. Cadmium can enhance mammary cancer cell growth even in levels observed in human blood.

Inorganic As3+, arsenite, also shares the estrogen-like property of Cd by blocking the binding site of estradiol to the alpha estrogen receptor. Even low concentrations of arsenite alter breast cancer cell cycles and can potentially increase the risk of breast cancer with continuous low exposure.

Biological Sampling:
Body burden from arsenic and cadmium can be measured by minimally-invasive approaches.

Arsenic concentrations in toenails are considered to be reflective of short-term exposure and associations have been observed with arsenic concentrations in soil, drinking water, air, and food.

Arsenic concentration in urine is the most commonly used biomarker of exposure to this metal, and is considered a marker of recent exposure by ingestion or inhalation.

Cadmium concentrations in urine are considered a marker of cumulative lifetime exposure to Cd.

Data collection:
60 Women participants from Nevada City and Grass Valley, ranging in age from 18-84, volunteered to provide urine samples and toe nail clippings for laboratory examination.

- Ages: 1/3 > 35 years, 1/3 > 35 years, 1/3 recent arrivals
- Length of residence: 1/3 long-term residents

A large questionnaire was sent to all participants asking numerous questions covering subjects such as: residential history, vitamin and mineral supplements, fish and produce consumption, outdoor activities, and smoking history.

Local Contamination:
EPA Brownfields Community Assessment revealed elevated concentrations of arsenic and cadmium in recreational areas.

- Arsenic in Pioneer Park = 89ppm
- Cadmium in an abandoned gold mine along a recreational trail: elevated in 42 of 55 soil samples (mean = 6.1ppm; high = 144ppm) CHHSL = 1.7ppm
- Providence Mine

Project Aims:
1. Establish a community dialogue about exposure to historical mining contaminants, the purpose and structure of a health and exposure study, information about study results, and ways to limit exposure, through community forums and a community advisory board.

2. Characterize body burden of Cd and inorganic As in relation to sociodemographic characteristics, length of residency in Gold Country, residential proximity to mine waste, and types of daily and recreational activities.

Preliminary Results:
Women who have lived in Nevada City and Grass Valley for over 10 years show an 80% higher level of Cadmium concentration than normal.

Shared trends in these women are living on dirt roads and owning pets.

Expected Results:
Women who have lived in the area longer, reside within close proximity to mine waste, participate in outdoor activities that may cause toxic inhalation, eat locally grown produce, and own pets that may track contaminants into a home have higher toxic metal concentrations.

It is expected that Cd and As concentrations accumulate over time in the body. Higher levels of these toxic metals increase breast cancer risk.

Although it is a hypothesis that Cd and As contribute to breast cancer, studies in Wisconsin, New York, Japan, and Sweden have all conducted research linking Cadmium to increased breast cancer risk. There are few epidemiologic studies exploring exposure to arsenic and its link to cancer, which is more reason to investigate the abundant toxic metal.