

SCIENTIFIC ABSTRACT

Limit is 5000 characters, including spaces and subtitles.
This form is used for both the peer and programmatic review.

Project Title: Cadmium and arsenic exposure in a mining-impacted community

Background: Arsenic (As) and cadmium (Cd) are both carcinogenic and endocrine-disrupting metals that are pervasive contaminants throughout the Gold Country region of northern California as a result of extensive gold mining that began with the 1849 Gold Rush. No human exposure or health studies have been conducted in this region to determine whether residents have elevated body burden levels of these metals. Furthermore, the three most populous counties in this region have breast cancer rates that rank in the top ten of California counties. This project seeks to determine whether further study is warranted to examine whether exposures to legacy mining contaminants are related to the incidence of breast cancer.

Hypothesis/Questions: The primary hypothesis of this proposal is that body burden levels of Cd and As are elevated among residents in a gold-mining community.

Specific Aims: 1. Establish a community dialog about exposure to historical mining contaminants, the purpose and design of a health and exposure study, information about study results, and ways to limit exposure, via community forums and a community advisory board.
2. Conduct a pilot biological measurement study to characterize body burden of Cd and As in relation to sociodemographic characteristics, length of residency in Gold Country, residential proximity to mine waste, and types of daily and recreational activities.

Methods: A total of 60 women who are residents of western Nevada County will be recruited for a biomonitoring study. Participants will complete an interview to elicit basic sociodemographic, residential, and activity data and provide minimally-invasive biological samples consisting of toenail clippings for the measurement of As and first morning void urines for the measurement of Cd and speciated As. Statistical analysis of the biological samples and interview data will be conducted to determine the relative contributions of length of residence in Gold Country, residential proximity to mine waste, activity patterns, and sociodemographic characteristics.

Impact: The study will provide a preliminary characterization of the association between body burden levels of toxic metals and residence in communities with potentially significant exposure opportunity to the residuum of historical gold mining, laying the groundwork for future epidemiologic research to evaluate whether these exposures impact the risk of breast cancer and other human health outcomes. Exposure information will also inform evidence-based policy and health outreach efforts to identify opportunities for minimizing exposures and for environmental remediation.

Community involvement: The development of this project was prompted by community opposition to plans to reopen a major gold mine. Sierra Streams Institute (SSI) is a non-profit scientific monitoring, restoration, education and research organization based in Nevada City. Founded as Friends of Deer Creek by a group of concerned local residents, the group remains a citizen-based grassroots organization dedicated to engaging local people in the stewardship of their own environment. Community concern was evident in a 2011 conference, hosted by SSI and CBCRP to encourage community-based projects that further the state of knowledge of the etiology of breast cancer, which led to demand for a study of the health effects of living among abandoned mine waste. A community survey conducted by Sierra Streams Institute in 2012 confirmed the level of concern, with 85% of respondents agreeing that abandoned gold mine waste is a human health hazard. SSI on behalf of the community has worked closely with CPIC and UNR over the course fourteen months to develop a project that will address the community's concern. The community will be involved in all stages of the project, including participating in a community advisory board, designing the study, participating in the study, interpreting the findings, and guiding future plans.

Future Plans: Findings from this pilot project will serve as the foundation for future research on the effect of metals exposures on the risks of breast cancer and other health outcomes. Further research activities may include: evaluating the geographic distribution of breast cancer incidence in relation to the location of abandoned mine sites; biomonitoring of

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additional mining contaminants such as lead and mercury; expanding biological specimen collection to include a larger geographic area; residential dust sampling; studies of other outcomes related to exposure to mining contaminants such as other cancers, birth outcomes, and overall mortality. This planned future research will benefit community residents by empowering the work of citizen scientists, determining and disseminating strategies that will minimize exposure, and supporting requests for funding the remediation of Gold Country's toxic mining legacy.