

GRADUATE STUDENT ABSTRACTS

Social Isolation Impacts Depression, Anxiety, and Drug Vulnerability in Adolescent Mice

Gelsey Aldana

Social isolation due to the COVID-19 pandemic has precipitated many stress-related mental illnesses, particularly in adolescents. Social isolation can lead to increased levels of depression and anxiety, as well as increase the risk of substance abuse. It is important to explore how this particularly relevant stressor can affect adolescent brain development. The purpose of this study is to examine whether mice that undergo a prolonged period of isolation during adolescence demonstrate differences in depression- and anxiety-like behaviors and cocaine sensitization. To examine the effects of social isolation, mice were utilized. When mice are weaned, they are isolated for 21 days. After the 21 days of isolation, the mice utilized in this study underwent a series of behavioral tests. Through these tests, depression-like behaviors were assessed in the forced swim test, anxiety-like behaviors were examined in the elevated plus maze and open field test, social preference was examined in a social interaction test, and cocaine sensitization was examined through a conditioned place preference. Preliminary data demonstrated that socially housed mice showed decreased depression- and anxiety-like behaviors when compared to isolated mice suggesting that social support has a stress-reducing effect. The results of this study will allow for further understanding of the effect of adolescent social isolation and its effect on depression- and anxiety-like behaviors, as well as their vulnerability to cocaine.

A Comparison of Two Stable Isotope Sampling Methods for Dentinal Collagen

Erin Boyle

Archaeological studies into early childhood diet and weaning patterns have been conducted for decades. Stable isotope analysis of dentin, a tissue found within teeth, allows researchers to view chemical signatures in the growth layers of teeth to infer changes in diet over time. These results then indicate important information about past societies such as their environments, subsistence strategies, labor structures, and ideologies. However, the strength of these archaeological interpretations rely directly on the reliability of methodology. Dentin microsectioning is a technique of taking very small samples from teeth for precise stable isotopic analysis. Whole teeth are first demineralized in acid before being portioned into smaller microsections. These microsections are then individually treated with slightly acidic water to extract the collagen, which can then be measured for ratios of stable carbon and nitrogen isotopes. The earliest form of this technique involved slicing the dentin into approximately twelve horizontal strips. Later work recommended a different approach: removing much smaller cores of dentin using a biopsy punch, sometimes more than twenty per tooth. This later method was suggested to provide finer-resolution data despite being more labor-intensive and more subject to chemical contamination. Subsequent authors often take as fact that the latter method is superior, but only one previous work has compared the two methods empirically. Using human permanent first molars from a pre-European-contact Ohlone site, this study seeks to test whether the two methods produce statistically different results by performing both methods on

the same teeth. To date, samples have been prepared and are being analyzed at an external lab. The resultant data, expected by early 2023, are anticipated to show slight but not statistically significant differences between the two methods. Future researchers can use these results to weigh the benefits and drawbacks of each method. These results will also provide insight to Californian prehistory as they will be illustrated through a case study on dietary strategies and cultural change within a pre-European-contact Ohlone society.

Access to Care: Exploring the Use of Telehealth Services During the COVID-19 Pandemic

Janessa Brierton

Telehealth services in the United States boomed during the COVID-19 pandemic and have continued to transform the healthcare landscape. Prior to COVID-19, telehealth services were typically constrained by strict requirements that had to be met for insurance reimbursements. This paper presents a novel empirical study that utilizes data from the Centers of Disease Control and Prevention (CDC) via the National Center for Health Statistics. In particular, this study explores demand for telehealth services in the US during the pandemic. This research empirically shows that older individuals have sought virtual medical appointments at a greater rate to minimize the risk of contracting the virus. It also shows that those living in metropolitan areas have utilized telehealth visits more frequently, which is likely a function of greater access to healthcare resources. Finally, this study shows that certain chronic conditions, such as diabetes mellitus, lead to such patients utilizing telehealth services at a higher rate given their increased susceptibility to the virus.

De Eso No Se Habla: How Latinx Communities Communicate About Sex (Education)

Samantha Di Lelio Boice

This study was designed to better understand how sex is communicated within Latinx and Hispanic communities. A review of literature revealed that sex and sex education are considered to be highly taboo topics that are seldom talked about within Latinx and Hispanic communities. Researchers have identified tradition, beliefs, and attitudes as variables that influence whether sex education/communication occurs. Previous studies on this topic have shown that Latinos in the United States are disproportionately affected by HIV and sexually transmitted infections, accounting for about 24 % of newly diagnosed AIDS cases each year. They are also two to three times more likely to develop STIs when compared with non-Latino whites. The largest contributing factor to these outcomes is limited knowledge of STIs. Despite these known challenges specific to Latinx and Hispanic individuals, few studies have incorporated the voices and experiences of Latinx and Hispanic individuals in this body of literature. To address this gap, one-on-one interviews will be conducted with Latinx/Hispanic individuals aged 18 and up to inquire about their first-person accounts of their first exposures to family communication about sex/sex education. The results of this study are expected to include a common experience in which participants report they did not receive “proper” education about sex-related issues through family communication alone. This study brings to light an issue that addresses the importance of sex education and how the lack of it among Latinx and Hispanic adolescents can lead to early initiation of sexual intercourse, which previous research suggests can come with potentially unknown

risks, such as unplanned pregnancy and sexually transmitted infection.

Potential Occurance of Naturally Occurring Asbestos in the Paradise, CA Area

Elisabeth Kennedy

Naturally occurring asbestos (NOA) refers to six regulated minerals in the serpentine and amphibole mineral groups that occur in a natural geologic setting. NOA minerals are resistant to heat and corrosion and have high tensile strength with long and slender mineral forms, typically with a 3:1 micron aspect ratio. As a recognized public health hazard due to the carcinogenic effects when inhaled or consumed, the mapped distribution of NOA is important to protect the public and workers from severe lung disease. The basement rocks underlying southern Magalia and northern Paradise are a series of interbedded serpentinites (metamorphosed ultramafic rock) and metavolcanic rocks. The serpentinites are currently mapped by the California Geological Survey as potential NOA sources, while the metavolcanics are not. Using a combination of geologic maps and known asbestos source maps, sixteen hand-samples were collected from sites identified in the field as serpentinitized ultramafic rocks or metamorphosed mafic metavolcanic rocks. Petrography, scanning electron microscopy (SEM), energy dispersive x-ray spectroscopy (EDS) and X-ray diffraction (XRD) analysis of metavolcanic and serpentinitized ultramafic rocks show the occurrence of asbestiform amphibole minerals and chrysotile veins, which is the asbestiform variety of the serpentine group minerals. Results have confirmed the presence of chrysotile fibers in the serpentinite, and analysis of the metavolcanics show they contain

unregulated asbestiform amphibole minerals, which have been shown to pose the same health hazards as regulated asbestos amphiboles. The findings of this study may result in local and statewide reclassification of potential NOA sources. This informs the best practices for dust mitigation during construction activities and opportunity for public education on asbestos hazards.

The Behavioral Ecology of Food Insecurity in Young Adults

Emily V. Mansilla

Behavioral ecology predicts that resource availability influences individuals' tendencies toward risk-taking. Specifically, individuals in resource-rich environments are predicted to show risk aversion, whereas individuals in resource-lean environments are predicted to show risk proneness. By extension, food insecurity (i.e., a resource-lean condition) could exacerbate risk-taking behavior, especially among already vulnerable populations such as young adults. Food insecurity (FI) is a common problem among college students in particular, with ten colleges in California reporting FI among 40% of students. Common interventions include food pantries and nutritional/cooking courses; however, physical and psychological barriers such as inconvenient hours of operation and stigma associated with FI limit their accessibility (Zein et al., 2018). The proposed research project is aimed at enhancing the accessibility of an effective FI intervention (i.e., food pantry availability) through a month-long food delivery program. A pre-post design is proposed to identify improvements in risk-taking behaviors prior to and following enrollment in the food delivery program. In particular, 20-30 participants reporting FI without food pantry exposure would receive scheduled food deliveries over the course of 30 days and complete

probability discounting tasks to assess potential shifts in risk-taking tendencies resulting from reduced FI. Ultimately, the goal of the project is to evaluate the proposed intervention's impact on risk sensitivity through a behavioral ecologic lens. Should greater access to food not only decrease self-reported FI but also risk-taking behaviors, food pantry delivery programs may prove valuable in preventing negative outcomes associated with FI in young adults. Adoption of food delivery programs by institutions of higher education may therefore confer significant improvements in quality of life and learning upon their attendees who experience chronic FI.

The Effects of Peer Mentorship on the Outcomes of SLP Graduate Student

Ashlley Martinez-Aguilar

Individuals from diverse backgrounds and first-generation students embarking on a career in Speech-Language Pathology (SLP) may find themselves isolated and academically disadvantaged compared to their peers. According to ASHA's 2021 demographic data report, only 8.7 percent of SLPs identify as underrepresented groups (ASHA 2022). To increase diversity, Stewart & Gonzalez (2002) discussed that universities must implement plans to attract diverse CSD students. The CMSD graduate program is rigorous and challenging and has yet to adopt a formal peer mentoring system, which may be one strategy to increase diversity. A mentorship program may increase student confidence in their ability to succeed academically and as future SLPs. This study investigated the effects of peer mentorship on the self-efficacy of CMSD graduate students. Self-efficacy is a person's belief in their ability to succeed. Students with higher self-efficacy ratings are more confident in their ability to control motivation, behavior, and environment. The study paired a second-year graduate student

with a first-year graduate student focusing on specific topics throughout the semester. The design of the mentorship program is adapted from Cole and Wright-Harp Multiple Mentor Model (2008), which uses multiple mentors to support and facilitate graduate students' progress in both academic and professional careers.

The peer mentor program followed Cole and Wright-Harp's model as a central theme for each meeting, yet conversational topics were open. Peer meetings were 30-60 minutes and scheduled in three-week intervals, followed by no meetings in the fourth week. The student rated their self-efficacy with a 5-point Likert scale every fourth week and was tracked across time. The mentor program lasted for one academic semester.

The results demonstrated that four of five students benefited from the mentor program and improved their self-efficacy in their first semester of graduate school; one student maintained self-efficacy scores (no change). More research is needed on the qualities of excellent mentorship programs, the long-term effects of being mentored during grad school, and how mentorship impacts outcomes (especially for underrepresented students). Overall, peer mentoring for first year graduate students may be an effective way to mitigate stress and improve sense of belonging for all.

How are the Children of Mexican Immigrants Building Resiliency in Pursuit of a Four-Year Degree?

Leticia Mejia

Obtaining a college degree is an achievement to be acknowledged, yet the journey to pursuing and completing such an accomplishment can be challenging and demanding. It is often hardships that bring the best out of individuals. The educational lived experiences of the research authors were the motivation for developing this study, examining the impor-

tance of how resiliency contributes to the academic success of children of Mexican immigrants. Unfortunately, there is limited research on how resilience can impact the success of children of immigrants seeking higher education. More research is needed to understand how resiliency contributes to the success of children of Mexican immigrants in achieving a 4-year college degree. This cross-sectional, qualitative research study is designed to examine how children of Mexican immigrants build resiliency in pursuit of a four-year college degree. The study seeks to understand why some children of Mexican immigrants chose to obtain a four-year college degree. The study further explores what resiliency factors, tools, and resources have contributed to the educational attainment among this target population. A total of twelve semi-structured, in-depth interviews were conducted to understand the resiliency and academic success of children of Mexican immigrants. The preliminary data analysis indicates that educational experiences, familianismo, and parents' sacrifice have heavily impacted the resiliency and success of children of Mexican immigrants who have attained a four-year college degree. This current study is imperative to enhance knowledge in identifying resiliency factors to support children of Mexican immigrants to further their educational success. Through this study, the researchers hope to contribute to the social work field by building upon the existing research on academic and social support for children of Mexican immigrants in the United States.

Binge-eating Alters Anxiety-Like Behaviors in Adolescent Female Mice

Parnaz Rezaie Boroon

Despite the increase in adolescents suffering from binge eating disorder, the consequences of this phenomenon are still widely unexplored in scientific research. Furthermore,

females are more likely to develop binge-eating disorder than males. As adolescent brains are not fully developed, commonly observed behaviors such as problematic eating may play a harmful role in the way their brain properly processes reward. This is especially important considering such alterations can render the adolescent brain more vulnerable to anxiety and depression-like behaviors. This study uses a novel model of binge-like eating behavior in adolescent mice to identify the ramifications of binge-eating disorder. Female adolescent C57BL/6J mice were exposed to standard chow or high-fat diet (HFD) for 2-h a day, three days a week (PND 39-64), for four weeks. Twenty-four hours later, cocaine reward was assessed. We also examined anxiety-like behavior using elevated plus maze (EPM), and depression-like behavior using the forced swim test (FST) and splash test. Animals exposed to HFD demonstrated greater food consumption, indicative of binge eating, during the four-week intermittent cycle compared to the standard chow group. During EPM, the HFD group spent more time in the open arms compared to mice given standard chow which highlights increased impulsive behaviors for us to examine in the future. While HFD mice were slightly less immobile in FST compared to standard chow mice, HFD mice also groomed themselves noticeably less than standard chow mice during the splash test, suggesting an increase in depression-like behavior due to their display of behavioral despair. Lastly, only the standard chow group developed preference for the compartment paired with cocaine. Our research findings suggest that binge eating in adolescence may contribute to increased anxiety- and depression-like behaviors. Therefore, binge eating disorder may exacerbate anxiety and depressive symptoms in vulnerable teenagers. Future studies should explore the neural mechanisms underlying these behaviors to better understand the

direct effect of binge eating on the adolescent brain.

Being Black/African American in a Predominately White Workforce: Challenges, Barriers, and Lessons Learned

Dominique Silva Soares

To date, there remain no peer-reviewed journal articles on the challenges and barriers of Black/African American human services professionals in White rural workforces. This cross-sectional qualitative study aimed to bring awareness to the challenges Black/African American human services professionals experience in the rural, predominantly White workforce. The research identified the challenges, barriers, and lessons learned from Black/African American professionals.

Purposive and snowball sampling methods were utilized to recruit seven participants who identified as Black human services professionals in a rural White community. All participants completed informed consents, a demographic questionnaire, and an open-ended interview with the principal investigator. Thematic analysis was used to identify significant themes. Results revealed that Black human services professionals in a predominately White rural community are code-switching to mitigate stereotypes and “fit in” with their White colleagues. They are viewed as the token race whenever their agency notices them; Black professionals are often asked to represent diversity and are walking on “eggshells,” adapting to the comfort levels of their colleagues.

Barriers included constantly questioning of one’s worth and value to the agency, an expectation to perform with perfection, the inability to feel a sense of belonging, and a lack of spaces where race can be safely discussed. Every participant reported the most important lesson learned by being a Black profes-

sional serving a rural, predominantly White community was finding support and building your community.

The sense of belonging and support is the driving force of human service work. The implication of this research study is applicable across various systems and practices as it highlights how employers are stressing the importance of community to assist clients, but are not implementing the community characteristics and its practice or policy in the office. The emotional taxation of adhering to job requirements and the pressure to perform every day among your clients and colleagues has a drastic effect on the body mentally, physically, and emotionally. As indicated in this research, Black/African American human services workers serving predominantly White rural communities experience more challenges and barriers in being their authentic selves as they encounter systematic obstacles to establishing their professional careers.

Investigating co-localization of histone H3 and mitochondria in *Arabidopsis thaliana* root cells

Sophia Thao

Histone H3 is a protein responsible for chromatin formation and gene regulation in eukaryotes. DNA strands condense into chromosomes by wrapping around a core of 8 histone proteins. Histone H3 is formed in the cytoplasm of the cell and is then imported into the nucleus. However, current research has concluded that histone H3 may also bind to the outer membrane of the mitochondria and potentially lead to programmed cell death (PCD). The previous studies required a process that requires the cell to be broken down in order to study binding activity. Therefore, the purpose of this research is to visualize histone H3 and the mitochondria in vivo by cross breeding two plants

with different fluorescent markers, one for histones and the other for mitochondria. We hypothesize that histone H3 will co-localize with the mitochondria in living cells, and that fluorescent microscopy can be used as a novel approach to determine binding activity. The pollen grains of flowers with red fluorescent histones were introduced to the isolated stigmata of flowers with yellow fluorescent mitochondria. Hybrid seeds have been collected and are currently in early stages of development. We will photograph the cells of parents and offspring to determine the location of histone H3 and the mitochondria. After layering images of the same cell with different colored filters, we predict that the fluorescence of histone H3 will overlap with the fluorescent mitochondria, indicating co-localization. The results of the project will provide more insight into histone H3 function and structure, specifically in relation to mitochondrial DNA (mtDNA) formation. Mitochondria have their own set of DNA and a histone protein bound to the mitochondria would suggest that mitochondria contains histone-like structures in the mtDNA. Future experiments could focus on the downstream effects of histone H3 binding to the mitochondria and the potential effects on human and animal cells that undergo PCD.

Do students learn best when using hands-on artifacts?

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This study focuses on using hands-on artifacts in laboratory activities increased students' conceptual understandings in science. Hands-on artifacts can apply to different subjects as well, but for the purpose of this study, we looked at undergraduate introductory geology courses. We conducted a study in which 11 teaching assistants (TAs) were asked questions about teaching and learning in introductory geoscience courses using the

Teaching Beliefs Inventory (1). One of the questions asked is, "How do your students learn science best?"; 61% of TAs interviewed believed hands-on learning helped their students learn science. We examined TA responses to define "hands-on" as physically interacting with an artifact, such as a rock or mineral. Using the TA definitions for hands-on, we compare learning in two introductory lab activities: plate tectonics (not hands-on) and minerals (hands-on), both of which were used in a face-to-face format. Based on fall 2021 pre- and post-course content survey responses, students had an average learning gain of 28% for plate tectonics and 50% for minerals. This comparison is consistent with improved learning in labs where students physically handle artifacts (hands-on). Learning gains are higher when students use artifacts to assist their learning, as evident in the learning gains for minerals labs with artifacts/face-to-face versus minerals labs with no artifacts/online. Another factor that contributes to higher learning gains is interest. Students were more interested in all forms of minerals labs (face-to-face and online) than in plate tectonics labs. All mineral labs have higher learning gains than plate tectonics labs. When we compared our face-to-face mineral labs learning gain data compared to face-to-face plate tectonics labs learning gain data, the results showed that hands-on manipulatives in labs increases student learning more than just student interest. This research is important because it can increase student engagement and motivation to learn and enhances different factors, such as perception, creativity, and logic. Science can be a challenging subject, so we are trying to find ways in which students can learn science better and have more fun. (1) Luft & Roehrig, 2007.

Regulation of Manganese Oxidation in *Pseudomonas putida* GB-1 by Two-Component Regulatory Pathways

John Vang

Manganese-oxidizing bacteria (MOB) and the manganese (Mn) oxide minerals they produce are being investigated for their uses in bioremediation which is the use of organisms, often microorganisms, to degrade and breakdown environmental pollutants. For example, MOB can be used to degrade painkillers found in wastewater that if left untreated can contaminate river systems, harming fish and people. *Pseudomonas putida* GB-1 is a well-characterized MOB that can be genetically manipulated, making it a useful model organism for the study of Mn oxidation. This study will focus on the regulation of Mn oxidation by a putative two-component regulatory (TCR) pathway called the Mnx TCR. A TCR pathway includes a sensor kinase (SK) and a response regulator (RR) that regulate gene expression in response to an environmental signal. In many cases, overexpression of a RR can suppress the loss of its cognate SK. The Mnx TCR pathway is predicted to include two SKs (MnxS1, MnxS2) and a RR (MnxR) because all three genes are essential for Mn oxidation, and the three genes are located together on the chromosome. Alternatively, the 2 SKs may each work with a separate RR to control Mn oxidation. Overexpression of the RR MnxR suppresses the oxidation defect of the *mnxS2* deletion strain. However, overexpression of MnxR did not suppress the loss of the MnxS1 sensor kinase. Additionally, the three genes are not found together on the chromosome in other Mn-oxidizing pseudomonads. Given these observations, we propose that MnxS1 works with a RR other than MnxR. The *P. putida* GB-1 genome is predicted to have 35 RR genes. Two candidate RR genes (PputGB1_2453, PputGB1_2469) were selected based on their

location near other Mn oxidation genes, lack of adjacent SK genes, and conservation in Mn-oxidizing but not non-oxidizing pseudomonads. Both RRs will be over-expressed in the $\Delta mnxS1$ strain. If either one suppresses the loss of MnxS1, this will support the hypothesis that MnxS1 works with this RR instead of MnxR. This work will improve our understanding of the regulation of Mn oxidation in *P. putida* GB-1 and will help optimize production of Mn oxidizes that will increase productivity in bioremediation.

Instructors Positionality: Facilitating Racial Discussion in the Classroom

Nhoua Xiong

The COVID-19 pandemic and racial violence in the summer of 2020 illuminated the invisibility of violence imposed on Black, Indigenous, People of Color (BIPOC) communities through decades of racist policies making it permissible and normative. In a system such as higher education, conceived to support and value white supremacy (dominant culture perspective, custom, and knowledge), instructors play a fundamental role in reproducing and reinforcing white hegemony. An exploratory quantitative research design with qualitative interviews was used to understand instructor awareness of positionality in relation to attitudes about their level of skills and knowledge facilitating discussions about race in the classroom. Such an approach aided in developing a base understanding of how instructors rate their confidence and understanding as well as exploring broader contexts of exposure to and experience with race. The quantitative data gathered included demographics and measured how instructors rate their comfortability, skills, and knowledge of facilitating discussions on race. The qualitative data was designed to be open ended, which allowed for a more in-depth understanding of the nuances of self-awareness of positionality and how this impacts

skills in facilitating discussions on race in the classroom. The results of this study indicated that most instructors are aware of their positionality and are comfortable with their perceived knowledge and skills to facilitate the conversation of race in the classroom. When splitting instructors into two groups, BIPOC and white, a striking pattern emerges from the data. White instructors consistently score higher than BIPOC instructors across three surveys. In contrast, the varied range of scores from BIPOC instructors may suggest BIPOC instructors are less likely to be influenced by social desirability response bias, or they understand the complexities of race in articulation with institution and culture, thus requiring future interrogation. In a profession where students are becoming more racially diverse, social work needs a broad adaptation from other disciplines. Different frameworks are necessary to ensure meaningful conversations around race are discussed in the classroom and prepare students to work in a racially diverse society.

Intergenerational Family Conflict in the Hmong Community

Pa Yang

The purpose of this study was to explore the relationship between acculturation, family functioning, and well-being. The Hmong community was a population of particular interest in this study. The main research question was: what are the pertinent issues that present challenges for the Hmong community? Additionally, based on past research, the study examined issues of the Hmong community related to acculturation and generation gap. In part 1, a qualitative design approach was used. This was done specifically through semi-structured interviews with Hmong Cultural Center Staff of Butte County, California. In part 2, a correlational quantitative design was used. This was done through a

Qualtrics survey. The results of part 1 showed that generation gap (e.g., language barriers and unshared cultural practices in families) is indeed a pertinent issue in the Hmong community. The results of part 2 showed that for the Hmong participants, family functioning and acculturation to American culture were significant predictors of well-being. Whereas, for the non-Hmong participants (e.g., Hispanics), family functioning and acculturation to ethnic culture were significant predictors of well-being. Overall, these findings suggest that the Hmong participants (who were mainly young adults) are highly acculturated to the American culture and that biculturalism of such communities should be researched further. Furthermore, due to this sample consisting of mainly young adults (ages 18-25), future research should gauge for acculturation levels from other age groups in order to have a better understanding of acculturation for this community as a whole.

Heavy metal concentration in non- and livestock-mortality compost

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Composting is a viable disposal option for livestock-mortalities and offal; however, it is illegal in California due to the perceived risk of disease transfer and heavy metal leaching into ground water. Mortality composting is a cost-effective option for ranchers. Objectives of this study were to determine heavy metal concentration in non- and livestock-mortality compost. The 59-day trial was conducted at the Chico State composting facility where treatments included: 1) non-mortality (i.e., control), 2) whole carcass, 3) bone-in offal and 4) boneless offal compost. Carcass and offal materials were bovine, porcine, and ovine. Carbon, nitrogen, and stock materials were similarly sourced. Control compost was produced using dairy manure and bedding

materials in the windrow method while carcass and offal treatments were produced using the mounding method. Decomposition occurred from day 1 to 43 followed by the pathogen reduction period (i.e., day 44 to 59) where temperatures were maintained at or above 55°C. A completely randomized design was used with analysis of variance and Tukey mean separation tests. Results indicate no difference ($P > 0.05$) among treatments for arsenic, cadmium, chromium, lead, molybdenum, and selenium. Copper ($P = 0.07$) and mercury ($P = 0.07$) tended to be different among treatments. Nickel concentration differed ($P = 0.01$) between boneless (61.07 ± 1.23 ppm) and control compost (56.13 ± 1.64 ppm; $P < 0.05$). Zinc concentration differed ($P = 0.04$) for bone-in offal and was lower (133.10 ± 5.85 ppm) compared to whole

carcass (177.23 ± 16.10 ppm) or control (174.13 ± 5.57 ppm; $P < 0.05$). Results suggest minimal heavy metal accumulation in non- and livestock-mortality compost and indicate that composting livestock carcasses and offal products can produce a product similar to conventional compost. Results contribute to a growing body of knowledge that could help justify livestock-mortality composting being implemented in California.

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Table 1. Heavy metal concentration (ppm) mean \pm SEM of non-mortality, whole carcass, bone-in offal and boneless offal compost.

Item	Min/Max, mg/kg	Conventional	Whole Carcass	Bone-in Offal	Boneless Offal	$P > F$
Arsenic	0.25	1.34 ± 0.61	0.90 ± 0.25	1.67 ± 0.14	2.06 ± 0.23	0.2033
Cadmium	0.03	0.12 ± 0.03	0.05 ± 0.01	0.07 ± 0.01	0.05 ± 0.02	0.1854
Chromium	0.1	166.33 ± 1.64	171.23 ± 17.93	170.00 ± 18.22	149.10 ± 10.23	0.7114
Copper	0.1	56.10 ± 1.82	50.53 ± 3.29	45.90 ± 1.76	50.57 ± 1.67	0.0703
Lead	0.5	2.73 ± 0.19	2.00 ± 0.10	2.40 ± 0.15	2.37 ± 0.27	0.1253
Mercury	0.05	0.02 ± 0.02	0.07 ± 0.02	0.03 ± 0.02	0.00 ± 0.00	0.0790
Molybdenum	0.1	2.90 ± 0.29	2.30 ± 0.47	1.83 ± 0.23	2.03 ± 0.37	0.2398
Nickel	0.1	56.13 ± 1.64	56.57 ± 0.03	60.53 ± 0.23	61.07 ± 1.23	0.0169
Selenium	0.5	1.13 ± 0.03	1.20 ± 0.10	1.03 ± 0.03	1.10 ± 0.06	0.3574
Zinc	0.05	174.13 ± 5.57	177.23 ± 16.10	133.10 ± 5.85	149.47 ± 9.68	0.0461