



**MOUNTAIN & PLAINS ERC**  
A NIOSH Education and Research Center for Occupational & Environmental Health & Safety

# Research Day Symposium




April 2024

Center for Health, Work & Environment  
colorado school of public health

**COLORADO STATE UNIVERSITY**  
Environmental & Occupational Health  
colorado school of public health

1

## Agenda- Up Next

-  Registration, Breakfast, Networking  
8:00 - 9:00 AM
-  Welcoming Remarks and Group Activity  
9:00 - 9:30 AM
-  Keynote Address  
9:30 - 10:00 AM

2

## Welcome Remarks

Please welcome our distinguished guests as we begin our 2024 Research Day Symposium.




**Cathy Bradley, PhD**  
Dean, Colorado School of Public Health





**Lee Newman, MD, MA,**  
Distinguished Professor,  
Colorado School of Public Health


3

## Morning Networking Session- Introduce Yourself

  
**Name**

  
**Program/  
Organization**

  
**Job  
Title**

  
**Question**

**Question: What did you want to be when you were a kid?**

4

**Keynote Address**

**Rebeca Velasco Reyna, MD**

National Coordinator of Occupational Health  
Instituto Mexicano del Seguro Social (IMSS)



5

**Entornos Laborales Seguros y Saludables (ELSSA)**

April 2024

**Safe and healthy labor environments**



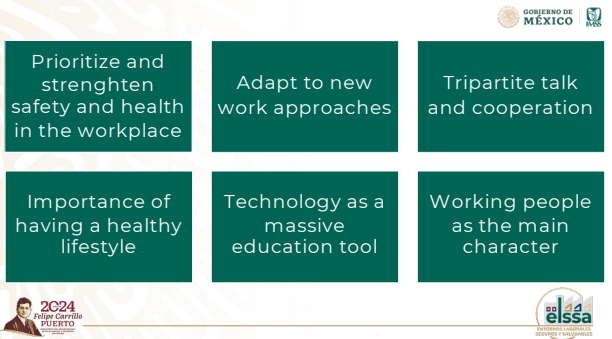
6

**What lessons did we learn from the COVID-19 pandemic?**

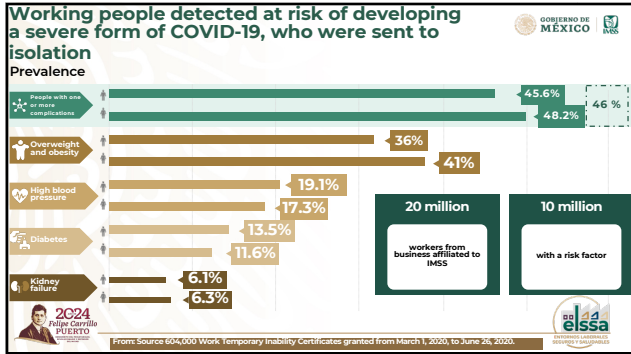



7

Prioritize and strengthen safety and health in the workplace	Adapt to new work approaches	Tripartite talk and cooperation
Importance of having a healthy lifestyle	Technology as a massive education tool	Working people as the main character



8



9

### What is ELSSA?

Voluntary program for companies to implement strategies and actions to improve **health, safety, and well-being** of workers, as well as **productivity and quality** in workplaces.

Promote safe and healthy work environments, focused on the prevention of the main health problems caused by occupational risks and general illnesses.

**Main objectives**

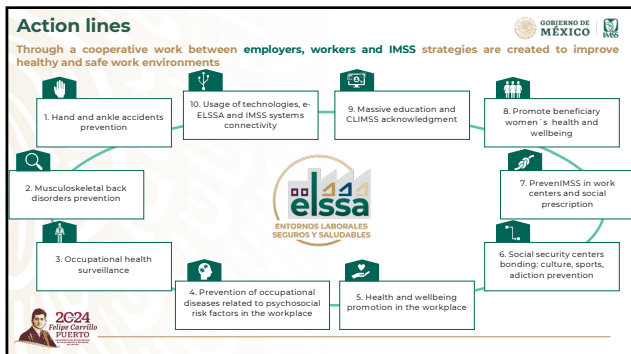
- Improve the health and well-being of workers.
- Prevent psychosocial and ergonomic risk factors, as well as chronic-degenerative diseases, occupational accidents and work-related illnesses.
- Improve productivity, considering that the greatest asset of companies is their workers.

Based on tripartite coordination and participation:

- FREE OF CHARGE
- VOLUNTARY
- NON-PUNITIVE

Company  
Employed population  
IMSS

10



11

### What does ELSSA offer?

ELSSA makes resources available to companies to support them in the implementation of actions regarding safety, health and well-being at work for the benefit of workers:

- Checklists
- Support material and technical sheets
- Support tools
- CLIMSS courses
- Optional, free of charge and non-punitive consultancy.
- Dashboard to visualize the evolution of work disabilities
- Georeference
- ELSSA emblem and Zero Accident Workplace emblem

12

**Checklists**

1. Hand and wrist accidents prevention
2. Musculoskeletal back disorders prevention
3. Occupational health surveillance
4. Prevention of occupational disease related with psychosocial risk factors in the workplace
5. Health and wellbeing promotion in the workplace

Acciones	Estatus de avance
Prevención de Accidentes de Trabajo en Mano y Muñeca	Avanzado
Prevención de Trastornos Musculares Esqueléticos en Espalda	Avanzado
Vigilancia de la Salud en el Trabajo	Avanzado
Prevención de enfermedades de trabajo relacionadas con factores de riesgo psicosociales en el trabajo	Avanzado
Promoción de la Salud y el Bienestar en las empresas de trabajo	Avanzado

2024 Poljeo Carrillo PUERTO  
elssa SECRETARÍA DE TRABAJO Y SEGURIDAD SOCIAL

13

**Support documents and technical sheets**

Prevención de enfermedades de trabajo relacionadas con factores de riesgo psicosociales en el trabajo

Prevención de Accidentes de Trabajo en Mano y Muñeca

Recomendaciones para la promoción de la alimentación saludable en empresas

Tabla de riesgos

2024 Poljeo Carrillo PUERTO  
elssa SECRETARÍA DE TRABAJO Y SEGURIDAD SOCIAL

14

**Support tools**  
For job position evaluation (psychosocial and ergonomic)

Files are available on ELSSA webpage and can be downloaded:

- Manuales de apoyo para la evaluación de los puestos de trabajo (psicosociales y ergonómicos)
- Revisión de fichas de apoyo
- Guía de referencia 2 de la NOM-035-STPS-2018
- Guía de referencia 3 de la NOM-035-STPS-2018
- Escuela NIOSH
- Rapid Entire Body Assessment
- Quick Method Analysis System

**Ergonomic evaluation**

- UNE-1005-2 standard method
- Method of the Technical Guide of the National Institute of Safety and Hygiene at Work
- NIOSH Equation
- Rapid Entire Body Assessment
- Ovako Working Analysis System

**Evaluation of psychosocial risk factors**

- Reference Guide 2 of NOM-035-STPS-2018
- Reference Guide 3 of NOM-035-STPS-2018

2024 Poljeo Carrillo PUERTO  
elssa SECRETARÍA DE TRABAJO Y SEGURIDAD SOCIAL

15

**Support tools**  
For job position evaluation (chemical agents)

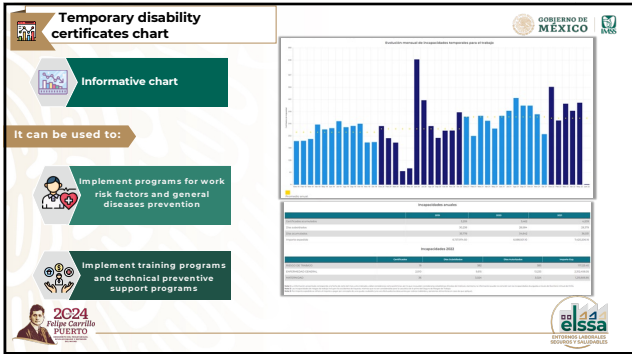
Available on ELSSA webpage:

Agencia Contaminante del ambiente laboral

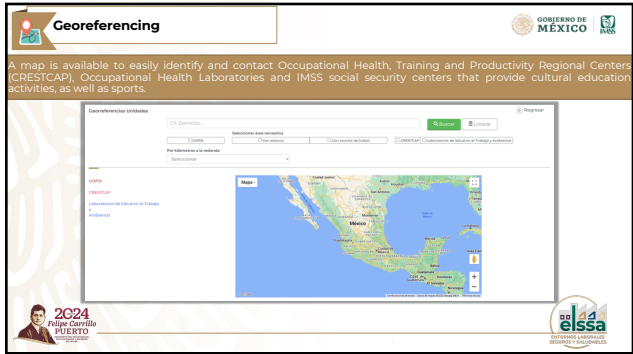
2024 Poljeo Carrillo PUERTO  
elssa SECRETARÍA DE TRABAJO Y SEGURIDAD SOCIAL

16

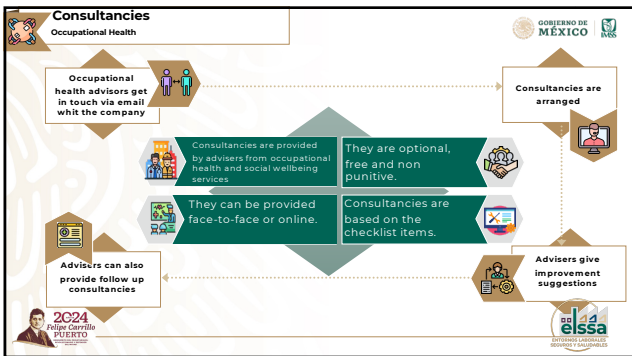




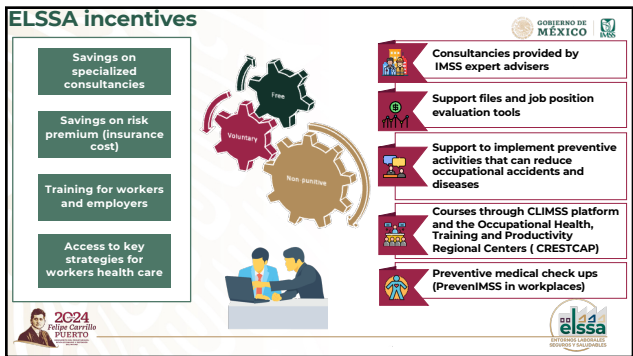
21



22



23



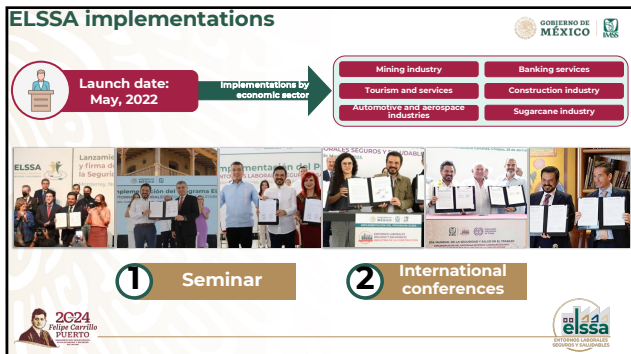
24



25



26



27



28



### ELSSA national award




**ELSSA national award**  
Involves actions in the five action lines.

1. Head and neck accidents prevention
2. Musculoskeletal back disorders prevention
3. Occupational health surveillance
4. Prevention of occupational diseases related with physical factors in the workplace
5. Health and safety promotion in the workplace



2024 Felipe Carrillo PUERTO

29

### ELSSA national award



**ELSSA national award winner (2023)**  
Involves activities in the five action lines.







2024 Felipe Carrillo PUERTO

30

### ELSSA national award



**ELSSA national award winner (2023)**

With the full participation of employees and their families, union, customers, suppliers, universities, government organizations and associations, a monthly program of health, safety, well-being and community service campaigns is carried out, led by the management team of the company.

This good practice is managed through annual and monthly scheduling of:


- **Activities.**
- **Workshops.**
- **Conferences**
- **Courses**
- **Etc.**

With various approaches: diversity, equity, inclusion and belonging; sustainability, education, community service, health, safety and well-being.

**Results or achievements obtained:**

- 25 campaigns carried out
- +22 thousand people benefited
- +\$6.5 million raised to support the community
- +10 thousand kilos of help
- +150 activities and 30 NGOs supported
- Around 2,600 people trained in health issues
- 110 units of blood donated
- 160 women with cancer screenings
- +5,000 graduated safety glasses awarded
- Nearly 5,000 medical checkups with detections of health
- 1,000 kg less in losing weight
- +40 thousand vaccines administered
- 3 races (5K)
- +20 sports tournaments
- 2 hiking walks
- 1 Ballaton (dance event)
- 500 people trained in CPR and use of AED
- 2,350 psychology sessions

**61% reduction in the accident rate**  
**76% reduction in time lost due to work risks**



2024 Felipe Carrillo PUERTO

31

### Certification of Occupational and Environmental Health Laboratories



Accredit and certify the Occupational and Environmental Health Laboratories in NMX-EC-15189-IMNC-2022, NMX-EC-17025-IMNC-2018 and NMX-CC-9001-IMNC-2015 standards, in order to guarantee the quality and reliability of analytical services.





2024 Felipe Carrillo PUERTO

32



### Promotion and dissemination campaigns

GOBIERNO DE MÉXICO

2024 Felipe Carrillo PUERTO

elssa ENTORNOS LABORALES SEGUROS Y SALUDABLES

ES PREVENIR ACCIDENTES EN TU TRABAJO

REVISAR que tu lugar de trabajo sea seguro.

COMUNICA

PERSONA TRABAJADORA, consulta los servicios que ofrece el IMSS.

¡Pregúntale sobre ELSSA!

Campaña to prevent workplace accidents. Advertising forums.

CAIDAS EN ZONAS HUMEDAS

PREVENCIÓN DE UN SUCCESO AUTOMÁTICO

ESTÁ PREVENIENDO UN ACCIDENTE EN TU TRABAJO

33

### Collaborative work

GOBIERNO DE MÉXICO

Colorado University

NIOSH

Health effects, respiratory function and toxicology laboratories.  
Work safety research.

Effectively implement the collaboration between ELSSA and VELAVO programs, along with obtaining the Zero Accident Workplace recognition.

STPS SECRETARÍA DE TRABAJO, SEGURIDAD SOCIAL Y PROTECCIÓN SOCIAL

Secretariat of Labor and Social Welfare (STPS)

2024 Felipe Carrillo PUERTO

elssa ENTORNOS LABORALES SEGUROS Y SALUDABLES

34

2024 Felipe Carrillo PUERTO

Thank you!

GOBIERNO DE MÉXICO

IMSS

elssa ENTORNOS LABORALES SEGUROS Y SALUDABLES

35

### Platform Presentations

10:00- 10:45 AM

Megan Zaiger

Investigation of Detonation Nondiamond Adsorption Rates for Radioactive Cesium in Water Samples

Rachel Perpich

Perceptions of Supportive Organizational Practices and Well-being Among LGBT+ Employees


Nick Stoll

An Agricultural Worker Wellbeing Assessment from a Total Worker Health+ Perspective

36

# Investigation of Detonation Nanodiamond Adsorption Rates for Radioactive Cesium in Water Samples


Megan Zaiger, Ralf Sudowe\*

Center for Health, Work & Environment  
 Environmental & Occupational Health  
research center for public health

37

## Outline


- Background
  - Why a new method is needed
  - Past adsorption techniques
  - Why we are using nanodiamonds
- Steps to make nanodiamonds
  - Batch study
- Things to consider
  - Cs-decay chain
  - Gamma Spectroscopy
- Results
  - Temperature
  - pH
  - Competing Ions
- Conclusions
- References
- Acknowledgements


Center for Health, Work & Environment  
 Environmental & Occupational Health  
research center for public health

38

## Background

- In 2011 an earthquake along the coast of Japan caused a 15 m high tsunami.
- The tsunami hit the Fukushima prefecture causing damage and devastation to the area and the Daiichi nuclear power plant.
- Contaminated water after the event is currently being stored on site. The main isotope of concern is Cs-137, which has a 30-year half life.
- TEPCO has begun releasing the water into the ocean after removing most of the contamination by the Advanced Liquid Processing System (ALPS).
- Lots of public concern about the water being released.

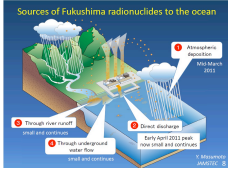



Center for Health, Work & Environment  
 Environmental & Occupational Health  
research center for public health

39

## Why a New Method is Needed

- The Daiichi Nuclear Powerplant is currently releasing the treated water into the ocean.
- The ALPS is a water pumping and filtration system that is used to remove radionuclides from the contaminated water.
- Current techniques to determine effective adsorption are very labor and time intensive.
  - Ex: Evaporation
- Need an efficient, rapid, and reliable method for determination of radiocesium in ocean water.



Center for Health, Work & Environment  
 Environmental & Occupational Health  
research center for public health

40

## Past Nanocarbon Uses and Results

- Nanocarbons were studied due to their strong structural base and large surface area.
  - Plant-based nanomaterials such as grain, cash crops, and pine residues were used to adsorb Uranium.
  - Decreases in adsorption rates were seen with changes in pH.
- Other nanomaterials used dispersed in water.
  - For example: ~5 nm algae samples.



Fullerene



Carbon nanotubes (CNTs)



Graphene



Carbon dots (Cdots)



Nano-diamonds (NDs)

Center for Health, Work &amp; Environment

MICHIGAN STATE UNIVERSITY

Environmental &amp; Occupational Health

41

## What is a Nanodiamond

- Nanodiamonds (DND) have a large surface area, don't disperse in water, and are resistant to radioactivity.
- Adsorption rates seen to be more than 99% in a pure water sample.
- This study will observe adsorption rates with varying pH, temperature, and competing ions.



Center for Health, Work &amp; Environment

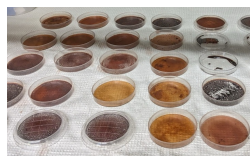
MICHIGAN STATE UNIVERSITY

Environmental &amp; Occupational Health

42

## Making Nanodiamonds

- Dried ND solution in a crucible at 100°C.
- Calcined DND in furnace at 400°C for 8 hours.
- Diluted DND back to 1% (w/w).



Center for Health, Work &amp; Environment

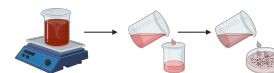
MICHIGAN STATE UNIVERSITY

Environmental &amp; Occupational Health

43

## Adsorbent Preparation

- Add 0.4 mL of 0.1 M  $\text{CuCl}_2$  to a 40 mL DI solution containing 0.4 mL of 1 wt% nanodiamonds and stir for 5 minutes.
- Add 0.4 mL of 0.05 M  $\text{K}_4[\text{Fe}(\text{CN})_6]$  to the solution and stir for 1 hr.
- Leave solution to sit overnight.
- Pipette off excess supernatant.
- Pour solution into petri dishes and let air dry.



Center for Health, Work &amp; Environment

MICHIGAN STATE UNIVERSITY

Environmental &amp; Occupational Health

44

### Batch Study

1. Massed amount of sorbent was added to a 15 mL centrifuge tube.
2. Deionized water and  $^{137}\text{Cs}$  stock solution were added.
3. Sample was mixed for a fixed time.
4. Adsorbent was allowed to settle overnight and then centrifuged.
5. Supernatant was removed and counted for remaining Cs-137 activity.

Center for Health, Work & Environment  
 MICHIGAN STATE UNIVERSITY  
 Environmental & Occupational Health

45

### Beta Minus Decay

$^{137}\text{Cs}$   $\xrightarrow{\beta^-}$   $^{137\text{m}}\text{Ba}$

$^{137}\text{Cs}$  has 55  $p^+$  and 82  $n$ .  
 $^{137\text{m}}\text{Ba}$  has 56  $p^+$  and 81  $n$ .

Center for Health, Work & Environment  
 MICHIGAN STATE UNIVERSITY  
 Environmental & Occupational Health

46

### Cs-137 Decay Chain

$^{55}_{30.07\text{ a}}\text{Cs-137}$

- $\beta^-$  0.512 MeV (94.6%)  $\rightarrow$   $^{56}_{2.55\text{ m}}\text{Ba-137m}$
- $\beta^-$  1.174 MeV (5.4%)  $\rightarrow$   $^{56}\text{Stable}$
- $\gamma$  0.6617 MeV (85.1%)  $\rightarrow$   $^{56}\text{Ba-137}$

Center for Health, Work & Environment  
 MICHIGAN STATE UNIVERSITY  
 Environmental & Occupational Health

47

### How Cs-137 is Detected

- A High Purity Germanium detector (HPGe) is utilized.
- It is used to measure gamma radiation.
- It measures the amount of Cs-137 remaining in the water sample after contact with DND and compared to the initial amount of Cs-137 added.

Center for Health, Work & Environment  
 MICHIGAN STATE UNIVERSITY  
 Environmental & Occupational Health

48

### Why Look at Temperature?

- Temperatures vary across different oceans which changes the binding of water molecules.
- Ocean water is the densest at 4°C.

Center for Health, Work & Environment  
 MORGAN ER  
 Environmental & Occupational Health

49

### Temperature Study

Center for Health, Work & Environment  
 MORGAN ER  
 Environmental & Occupational Health

50

### Temperature Study

Center for Health, Work & Environment  
 MORGAN ER  
 Environmental & Occupational Health

51

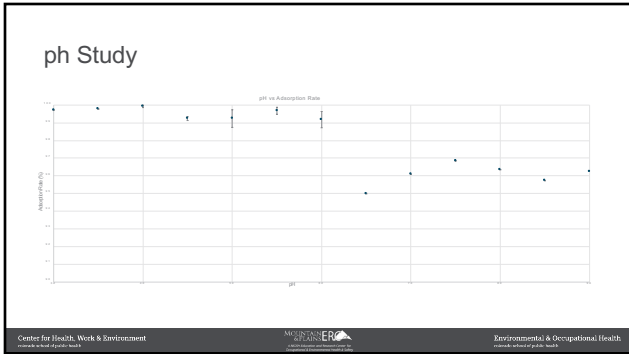
### Why Look at pH?

- Ocean water varies in pH with the average ocean pH of 8.4.
- Cs binds to the hydroxide in water.
- Important to look at large range to make sure adsorption rates do not change drastically in the environment.

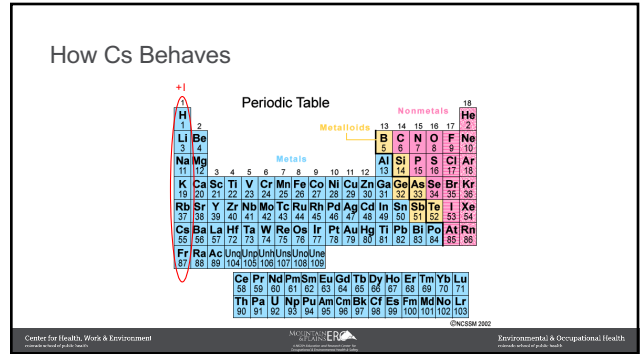
$$[\text{H}-\ddot{\text{O}}:]^- \quad \text{Cs} - \text{OH}$$

Center for Health, Work & Environment  
 MORGAN ER  
 Environmental & Occupational Health

52



53



54

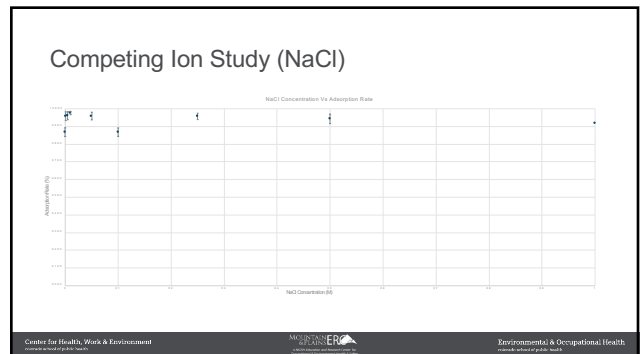
### Making of Salt Solutions and Why

- Want to look at competing ions.
- Most effective as salt solutions due to the salinity of the ocean and ease of use.
- Create different Molarity of salt solutions and use these in the batch study instead of regular DI water.

Dissolving Salt in Water

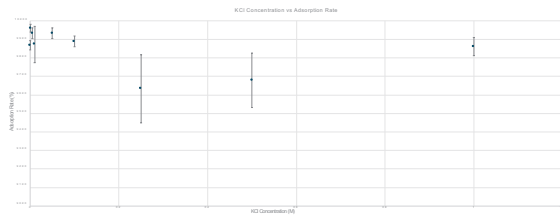
Center for Health, Work & Environment  
 MICHIGAN STATE UNIVERSITY  
 Environmental & Occupational Health

55



56

## Competing Ion Study (KCl)



Center for Health, Work & Environment  
Colorado School of Public Health

MILES  
AN ER

Environmental & Occupational Health  
Colorado School of Public Health

57

## Conclusions

- Temperature changes saw very minimal affect on adsorption rate with the lowest rate at 4°C at 98.83%.
- pH saw a decline in adsorption rates at more basic solutions. This is due to basic solutions having more hydroxides in which Cs-137 will bind causing a decrease in adsorption on the DND. Despite this drop in adsorption rate, pH has minimal effect with the adsorption rates higher than 95%.
- NaCl salt solution saw a minimal change with increasing concentration with a slight decline as concentration increased. There is an increase from 0.1 M to 0.25 M before the steady decline with the lowest adsorption rate at 0.1 M.
- KCl salt solution saw a fluctuation in adsorption rates particularly at 0.25 M and 0.5 M with a decline in adsorption rate starting at 0.1 M. Despite the fluctuation, adsorption rates continue to be high with the lowest being 96.33%. The 0.25 M and 0.5 M solution should be remade and counted to confirm any anomalies.

Center for Health, Work & Environment  
Colorado School of Public Health

MILES  
AN ER

Environmental & Occupational Health  
Colorado School of Public Health

58

## Future Work

- Low levels of stable Cs added in for low levels of Cs-137 uptake.
- Competing ions Rb and Li.
- Measuring adsorption rates of real and synthetic ocean and river water.
- Adsorption rates for different radioactive isotopes.

Center for Health, Work & Environment  
Colorado School of Public Health

MILES  
AN ER

Environmental & Occupational Health  
Colorado School of Public Health

59

## References

1. Deak, A. Study of hexacyanoferrate(II) nanodiamond absorbent for the preconcentration of cesium and size categorization of radiocesium particles from contaminated soils, M.S. Thesis, Colorado State University, 2021
2. Spectrum Techniques. Why Cs-137? <https://www.spectrumtechniques.com/product/cs-137-ba-137m-isotope-generator-kit/>.
3. Sudowe, R. Stewardship Science Academic Alliances (SSAA) Federal Assistance Application for FOA DE-FOA-0002457, Project Narrative Summary, Colorado State University, 2021
4. World Ocean Review. Water a Unique Molecule. <https://worldoceanreview.com/en/worldoceanreview/great-ocean-currents/water-a-unique-molecule/>.

Center for Health, Work & Environment  
Colorado School of Public Health

MILES  
AN ER

Environmental & Occupational Health  
Colorado School of Public Health

60



### Acknowledgements

This research was supported by the grant T42OH009229, funded by the National Institute of Occupational Safety and Health in the Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention or the Department of Health and Human Services.

The authors would like to acknowledge the rest of the Sudowe Research Group for their assistance.



Center for Health, Work & Environment



Environmental & Occupational Health

61

### Questions

Center for Health, Work & Environment



Environmental & Occupational Health

62

### Assessing Agriculture Worker Wellbeing from a *Total Worker Health*® Perspective

Nick Stoll, MPH

Center for Health, Work & Environment



Environmental & Occupational Health

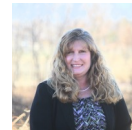
63

### Pilot Project Funding

This research was supported by the Cooperative Agreement number, U19OH011227, funded by the Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health. This content is solely the responsibility of the authors and does not necessarily represent the official views of the CDC.



Kathy James  
Associate Professor



Gwen Fisher  
Professor

Center for Health, Work & Environment



Environmental & Occupational Health

64

### Background

Center for Health, Work & Environment  
 MICHIGAN STATE UNIVERSITY  
 Environmental & Occupational Health

65

### Our approach...

CPH-NEW Total Worker Health®  
 "Integration" Model

Center for Health, Work & Environment  
 MICHIGAN STATE UNIVERSITY  
 Environmental & Occupational Health

66

### Objectives

1. To review an assessment of Ag worker wellbeing in the San Luis Valley from a Total Worker Health® perspective
2. Determine local organization/provider capacity for interventions
3. Identify "next steps" for supporting San Luis Valley Ag workers

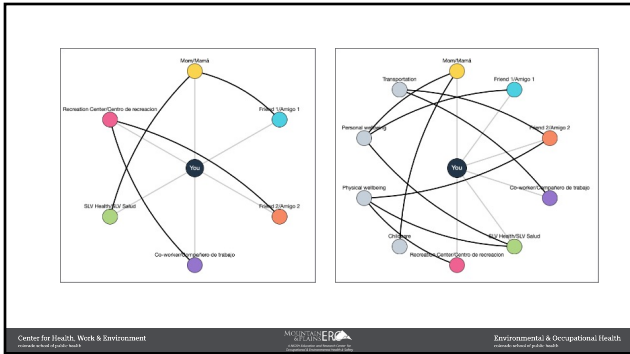
Center for Health, Work & Environment  
 MICHIGAN STATE UNIVERSITY  
 Environmental & Occupational Health

67

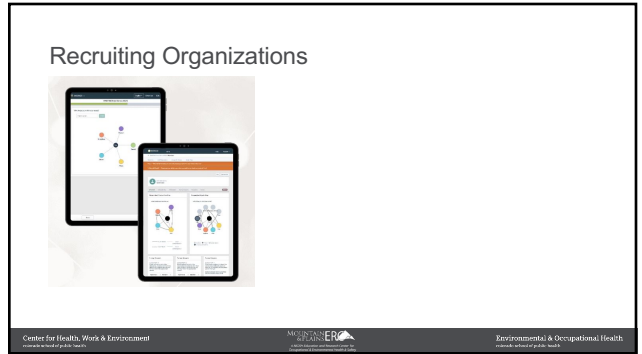
### Survey Development

Center for Health, Work & Environment  
 MICHIGAN STATE UNIVERSITY  
 Environmental & Occupational Health

68



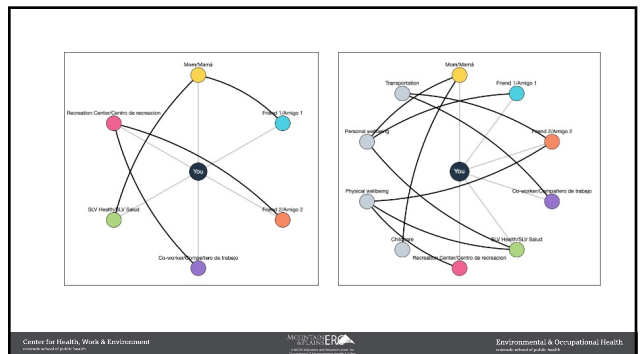
69



70



71



72

### Agriculture Workers Survey

Thank you for participating in this study. As a reminder, all of your answers will be confidential and stored in a secure database. If you have any questions, please contact the research team at (951) 261-1111. For more information, please visit the study website at [www.nera.ucdavis.edu](http://www.nera.ucdavis.edu).

### Your Personal Network

On this page you will enter a list of people that you know. You will be asked to provide their name, phone number, and email address. This information will be used to create a network diagram that shows the relationships between you and the people you know. This information will be used to understand the social support structure of agricultural workers.

**Instructions:**

- Enter the name of the person you know.
- Enter their phone number.
- Enter their email address.
- Click on the "Add" button to add the person to your network.

**Example:**

Name: John Doe  
Phone: (951) 123-4567  
Email: john.doe@example.com

**Network Diagram:**

Center for Health, Work & Environment  
MOUNTAIN VIEW ER  
Environmental & Occupational Health  
University of California, Davis

73

### Who did we reach?

- 235 respondents  
*(118 with survey completion rates adequate for formal analysis)*
- Survey language
  - 36% Spanish
  - 64% English
- Race/Ethnicity\*\*
  - 79% Hispanic/Latino
  - 4% Indigenous
  - 27% White

### Overall Recruitment

Role	Spanish	English
Operator	~12%	~12%
Field Worker	~28%	~45%

Center for Health, Work & Environment  
MOUNTAIN VIEW ER  
Environmental & Occupational Health  
University of California, Davis

74

### Identifying Sources of Stress

Source of Stress	Operators (%)	Field Workers (%)
1. Water resources	~15	~10
2. Physical health	~12	~10
3. Mental health	~10	~10
4. Insurance	~8	~10
5. Housing assistance	~7	~10

Center for Health, Work & Environment  
MOUNTAIN VIEW ER  
Environmental & Occupational Health  
University of California, Davis

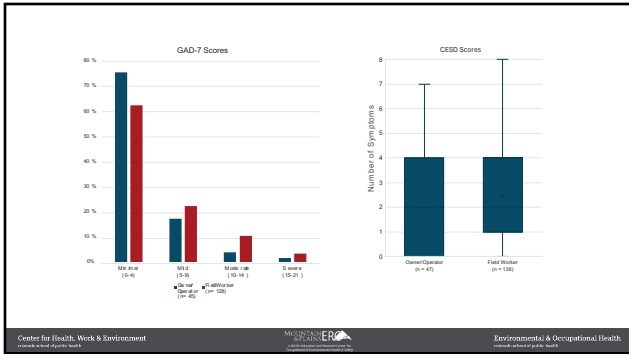
75

### WellBO Overall Health Status

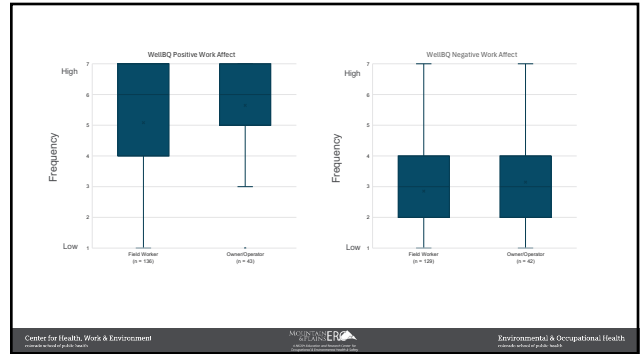
Health Status	Operator (%)	Field Worker (%)
Best	~5	~5
Very Good	~25	~28
Good	~38	~48
Marginal	~30	~15
Bad	~10	~10

Center for Health, Work & Environment  
MOUNTAIN VIEW ER  
Environmental & Occupational Health  
University of California, Davis

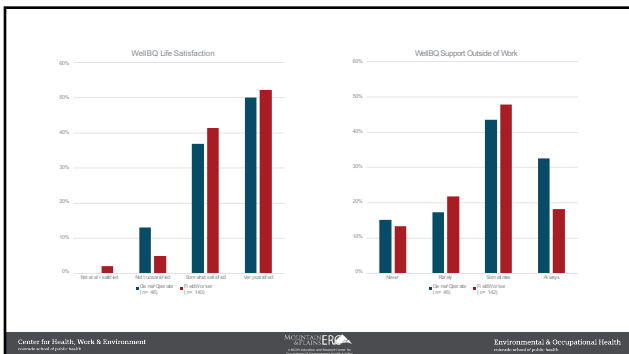
76



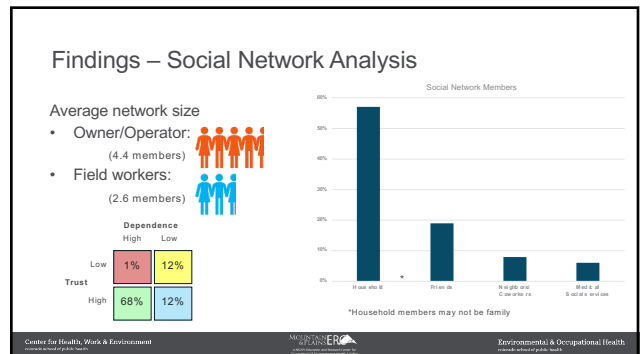
77



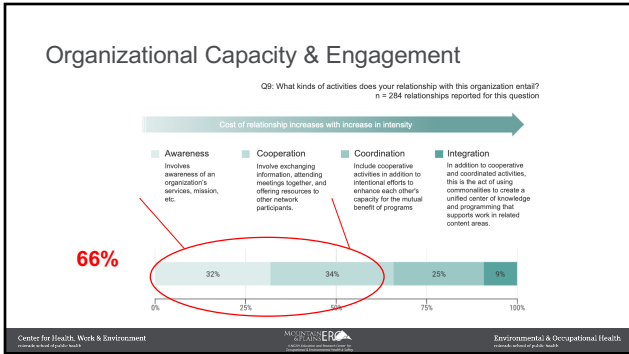
78



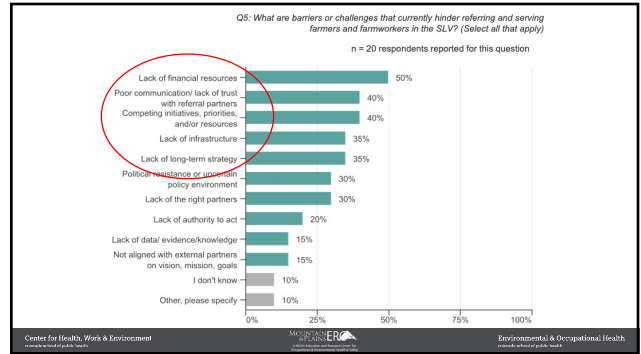
79



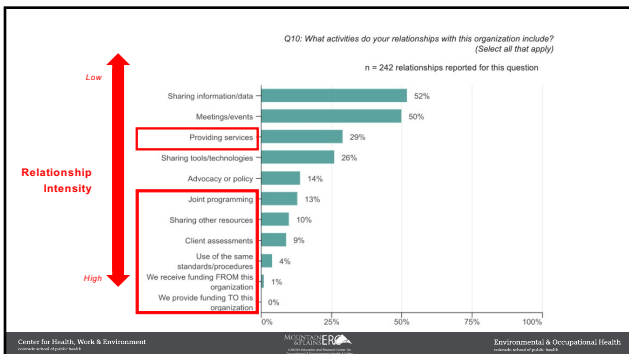
80



81



82



83

So where does this leave us?

Center for Health, Work & Environment  
MOUNTAIN STATE ERIC  
Environmental & Occupational Health

84

Findings/Conclusion

Health Status      An Occupational Lens      Target Stressors      Next Steps

Center for Health, Work & Environment      McGILL UNIVERSITY      Environmental & Occupational Health

85

**Break**  
10:45-11:00 AM

**Poster Sessions**  
11:00- 11:50 AM

Group A- Grand Ballroom 1 Climate Change	Group B- Grand Ballroom 4 Health Physics and Ergonomics & Safety
---	---

86

**Lunch**  
11:50 AM- 12:45 PM

**Free Professional Headshots**  
First come, first serve basis. Outside in lobby.

87

**Poster Sessions**  
12:45- 1:35 PM

Group A- Grand Ballroom 1 Occupational Health Psychology	Group B- Grand Ballroom 4 TWH/OEM/IH
---	---

**Break**  
1:35- 1:45 PM

88