

InTERACCT Project Overview

Progress in Research Series

Presenter: Rachael M. Jones, PhD, CIH

Updated 1/19/2022

***In*TERACCT**

Interdisciplinary Training, Education and Research Activities for
Assessing and Controlling Contaminants from Emerging Technologies

Funding for InTERACCT is provided by the
National Institute of Environmental Health
Sciences (NIEHS) of the National Institutes of
Health, award number R25ES033035

essi.umn.edu/interacct



**SCHOOL OF
PUBLIC HEALTH**

UNIVERSITY OF MINNESOTA

Susan Arnold (PI)

Tran Huynh (co-I)

Amy Limbybliw

Allison Iwan

Joy Archibald

***In*TERACCT**



Fielding School of Public Health
**Environmental
Health Sciences**

Rachael Jones (co-I)

Saisattha Noomnual

IOWA

PUBLIC HEALTH

Tom Peters (co-I)

Patrick O'Shaughnessy (co-I)

Derek Siebert

Our Fearless Leader, Dr. Arnold



Goals

Build an occupational health and safety workforce capable of anticipating and preventing hazards from emerging technologies.

Aim 1. Develop three core courses that build cross-cutting skills. *The core courses are: 1) chemical hazard recognition, 2) exposure assessment and 3) cumulative risk assessment. Case studies demonstrate application to emerging technologies.*

Aim 2. Provide research experiences for graduate students to apply recognition and risk assessment skills to emerging technologies. *This is transitioning to a week-long summer intensive program for undergraduate students.*

Aim 3. Integrate new course content into ongoing academic curricula and continuing education professional development courses.

Scope

Target Audience

- Students in IH academic programs (graduate and undergraduate)
- Adult learners in allied fields
- Practicing IHS seeking review or technology-specific information

Technology Focus

- Additive manufacturing
- Nanomaterials
- Novel drug delivery

Building on METPHAST

Midwest Emerging Technologies Public Health & Safety Training Program (NIEHS R25ES023595)

- Introduction to Occupational Hygiene
- Nanotechnology Health & Safety
- <https://www.youtube.com/channel/UC8OS96CgraPftseRCo4hjuw>

InTERACCT

Interdisciplinary Training, Education and Research Activities for
Assessing and Controlling Contaminants from Emerging Technologies



The METPHAST team graphic features logos for the University of Minnesota School of Public Health, The University of Iowa College of Public Health, and Dakota County Technical College. Below the logos is a blue bar with the text 'THE METPHAST TEAM'. Three team members are listed with their photos, names, and titles.

SCHOOL OF PUBLIC HEALTH
UNIVERSITY OF MINNESOTA

THE UNIVERSITY OF IOWA | College of Public Health

DAKOTA COUNTY
TECHNICAL COLLEGE

THE METPHAST TEAM

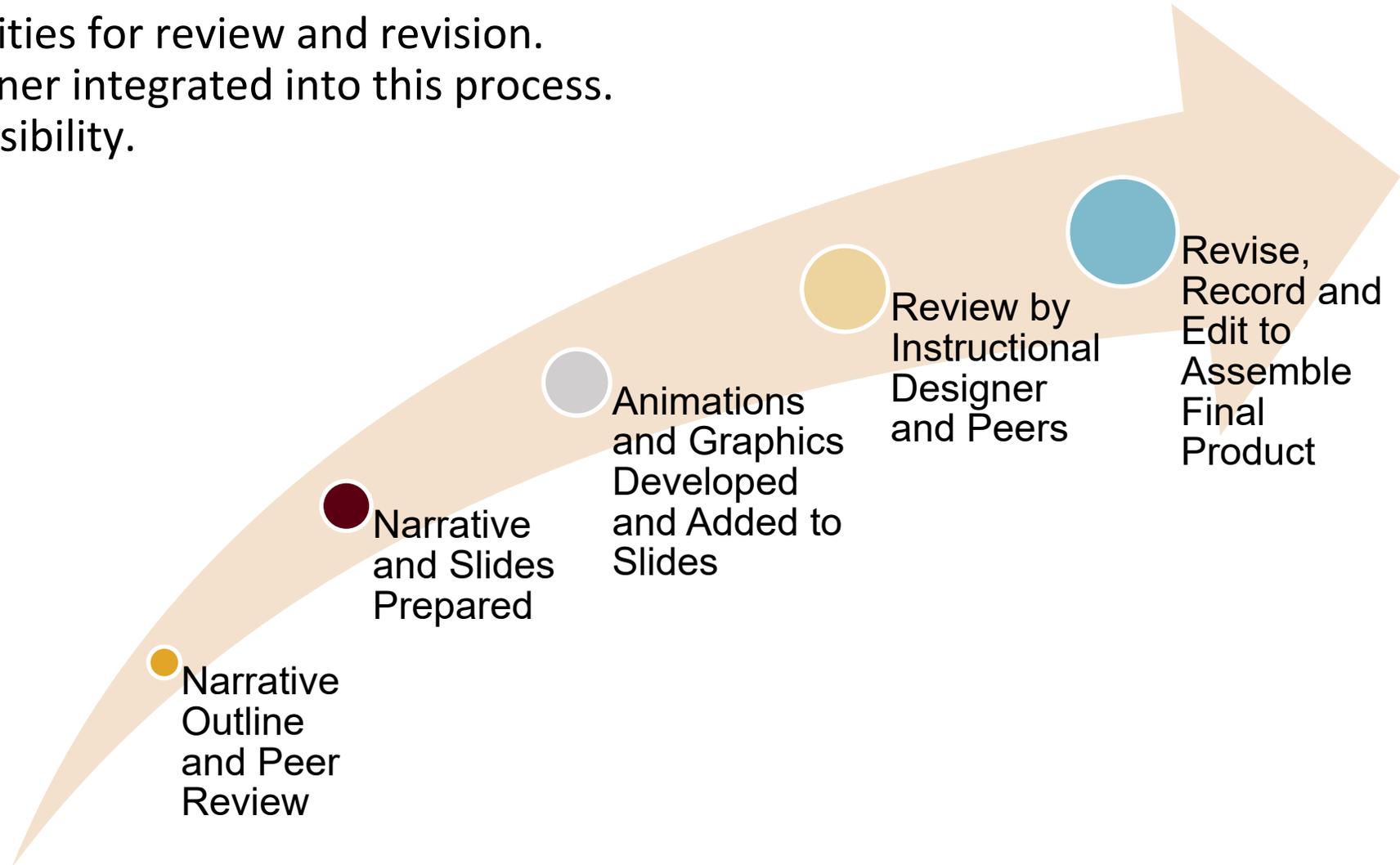

Pete Raynor, PhD
Professor, Division of Environmental Health Sciences, University of Minnesota School of Public Health


Tom Peters, PhD, CIH
Professor, Occupational and Environmental Health, University of Iowa College of Public Health


Billie Copley
Project Manager, Dakota County Technical College

Aim 1: Course Design Strategy

Multiple opportunities for review and revision.
Instructional designer integrated into this process.
Emphasis on accessibility.



Core Course 1: Chemical Hazard Recognition

Through twelve (12) modules, the course will prepare learners to:

1. Identify potential hazards associated with different classes of chemicals
2. Use a range of data visualization tools to both learn and teach others about these hazards
3. Explain qualitatively and quantitatively the factors governing the generation and dispersal of chemical agents and recognize potential tasks and environments in which chemical exposures may be especially hazardous
4. Describe how the properties and behavior of chemicals influence their impact on human health
5. Support assessment of exposures to meet conventional industrial hygiene and future population-based exposure assessment by documenting specific information about chemical hazards, such as from databases and the scientific literature

Course Access and Accessibility

You Tube:

https://www.youtube.com/@interacct_umn

- Recordings

University of Minnesota Exposure Science and Sustainability Institute:

<https://essi.umn.edu/interacct/>

- Recordings
- Slides
- Transcripts

The screenshot shows the InTERACCT website homepage. At the top, there is a navigation bar with links for ABOUT, SERVICES, RESOURCES, INTERACCT, NEWS, CONTACT, and a GIVE button. The main header features the InTERACCT logo and tagline: "Interdisciplinary Training, Education and Research Activities for Assessing and Controlling Contaminants from Emerging Technologies". Below this, there are several text blocks: a paragraph about rapid adoption of emerging technologies, a paragraph about equipping health and safety workforces, and a paragraph about the program's goals. A "View Modules" button is prominently displayed. The right sidebar contains an "InTERACCT Menu" with links to About, Personnel, Advisory Board, Training Modules, and Tools. Below the menu is a "Subscribe to Our YouTube Channel" section with a YouTube subscribe button and a note that training modules are available on the channel. Further down is a "Contact Us" section with the email address interacct@umn.edu. At the bottom of the sidebar is a "NIH Kick-Off Presentation Slides" section with a thumbnail image and a link to download slides from a December 13, 2021 kick-off event. The main content area also includes a "SPECIFIC AIMS" section with three bullet points detailing the program's goals.

ESSI Exposure Science and Sustainability Institute

ABOUT SERVICES RESOURCES INTERACCT NEWS CONTACT \$ GIVE

InTERACCT

Interdisciplinary Training, Education and Research Activities for Assessing and Controlling Contaminants from Emerging Technologies

Rapid adoption of emerging technologies in the workplace can present novel exposure scenarios and unintended health risks among workers.

Equipping a health and safety workforce to assess and control unanticipated exposures to both familiar and novel contaminants associated with emerging technologies in the context of limited data will help prevent occupational disease and loss of life.

The Interdisciplinary Training, Education and Research Activities for Assessing and Controlling Contaminants from Emerging Technologies (InTERACCT) Program will help build an occupational health and safety workforce capable of anticipating and preventing hazards from emerging technologies. Cross-cutting skills will be developed through three core courses: chemical hazard recognition, exposure assessment and cumulative risk assessment.

These skills will be applied to three emerging technologies: nanotechnology (NT), additive manufacturing (AM), and novel drug delivery (NDD). The cross-cutting skills developed among participants in InTERACCT will empower them to respond appropriately to the unique characteristics of emerging technologies, and to innovations in health and safety.

- INTERACCT PERSONNEL
- INTERACCT ADVISORY BOARD

InTERACCT TRAINING MODULES

Access free online training videos in Chemical Hazard Recognition.

View Modules

SPECIFIC AIMS

- ▶ Aim 1: Develop three core courses that build cross-cutting skills in the areas of chemical hazard recognition, exposure assessment and risk assessment.
- ▶ Aim 2: Provide research experiences for graduate students to apply recognition and risk assessment skills to emerging technologies within NT, AM and NDD.
- ▶ Aim 3: Integrate new course content into ongoing academic curricula and continuing education/professional development courses.

InTERACCT Menu

- ▶ About InTERACCT
- ▶ InTERACCT Personnel
- ▶ InTERACCT Advisory Board
- ▶ InTERACCT Training Modules
- ▶ Tools and Resources

Subscribe to Our YouTube Channel

YouTube SUBSCRIBE

All of the InTERACCT training modules are available on our YouTube channel. **Subscribe** to receive notifications when new videos are posted.

Contact Us

interacct@umn.edu

NIH Kick-Off Presentation Slides

Download slides from the NIH Kick-Off December 13, 2021
PPT | PDF

Funding for InTERACCT provided by the National Institute of Environmental Health Sciences (NIEHS) of the National Institutes of Health, award number R25ES032025.

Sample Slide: Types of Additive Manufacturing

Directed Energy Deposition

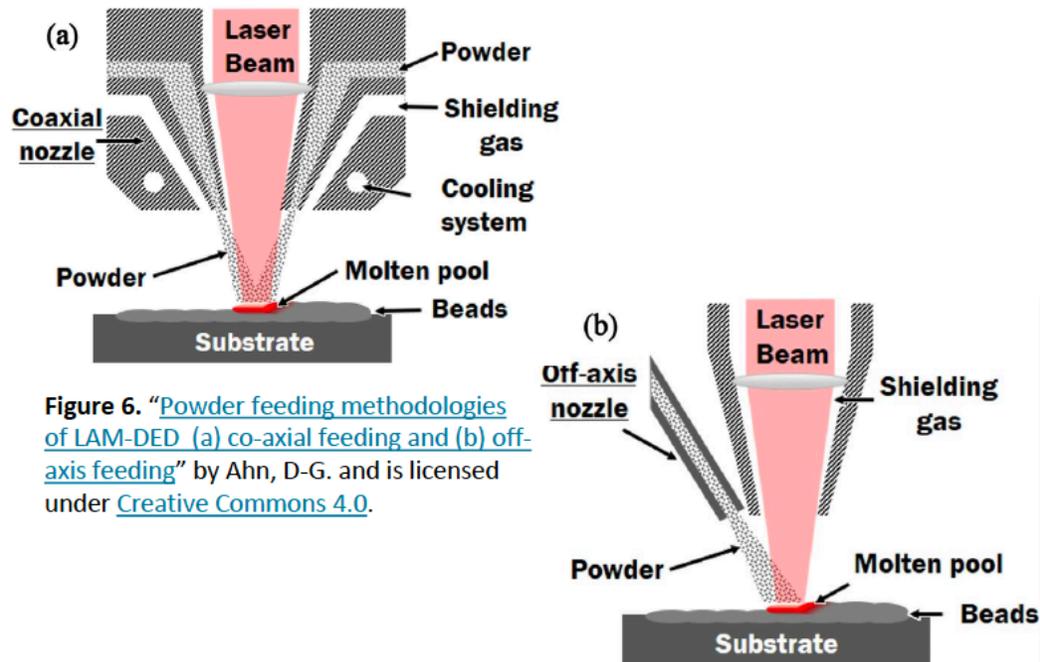


Figure 6. "Powder feeding methodologies of LAM-DED (a) co-axial feeding and (b) off-axis feeding" by Ahn, D-G. and is licensed under [Creative Commons 4.0](https://creativecommons.org/licenses/by/4.0/).

Major Process Steps

- Pre-printing
 - Loading wire or powder
- Post-printing
 - Opening doors to retrieve part
 - Cutting parts from build platform
- Post-processing
 - Machining part to finalize part dimensions

InTERACCT

Authors:
Rebecca Burton
Susan Arnold

Sample Slide: Organizations that Establish OELs

Organizations that Establish OELs

- Occupational Health and Safety Administration (OSHA)
- American Conference of Governmental Industrial Hygienists (ACGIH)
- National Institute for Occupational Safety and Health (NIOSH)
- **European Chemicals Agency (ECHA)**

InTERACCT

Author: Rachael Jones

InTERACCT

Sample Slide: Organizations that Establish OELs

Organizations

- Occupational Safety and Health Administration (OSHA)
- American Conference of Governmental Industrial Hygienists
- National Institute for Occupational Safety and Health (NIOSH)
- **European Chemical Agency**

InTERACCT

Organizations that establish OELs. In the United States, we typically look to three organizations for occupational exposure limits. First is the Occupational Safety and Health Administration, also known as OSHA, which sets occupational exposure limits that are regulations. Employers are required by law to comply with occupational exposure limits set by OSHA. States that have state managed OSHA programs may also set occupational exposure limits that are regulations used in that state alone. State based regulations must be at least as protective as the regulations set by federal OSHA.

The American Conference of Governmental Industrial Hygienists, also known as the ACGIH, sets recommended occupational exposure limits, and these limits are used globally in industrial hygiene practice and in some places are adopted as regulations. The National Institute for Occupational Safety and Health, also known as NIOSH, sets recommended occupational exposure limits. Often, NIOSH makes recommendations in anticipation of regulatory actions that are being considered by OSHA.

In Europe, the European Chemicals Agency known as ECHA, sets OELs based on the authority provided in the Chemical Agents Directive 98/24/EC, the Carcinogens and Mutagens Directive 2004/37/EC, and other directives. Several federal governments within the European unit also set occupational exposure limits. Industrial hygienists in the United States are typically most familiar with those set by the German Senate Commission for the Investigation of Health Hazards on Chemical Compounds in the Work Area, better known as the MAK, M-A-K Commission.

Sample Slides: Animation

Author: Susan Arnold
Animations: Derek Siebert

<https://www.youtube.com/watch?v=UuLGf5jkGOY>
Start 1:45

Aim 1: Progress and Impact to Date

- Eighteen (18) modules from the Chemical Hazard Recognition course are available on YouTube
 - https://www.youtube.com/@interacct_umn/playlists
 - Most views are of “Using the Structured Deterministic Module to Conduct a Preliminary Exposure Assessment” (n = 249 as of April 15)
- Templates and a workflow have been developed for module development
- Faculty have improved understanding of instructional design

InTERACCT

Interdisciplinary Training, Education and Research Activities for
Assessing and Controlling Contaminants from Emerging Technologies

Aim 1: Next Steps

InTERACCT

Interdisciplinary Training, Education and Research Activities for
Assessing and Controlling Contaminants from Emerging Technologies

- The exposure assessment course has been planned, and the majority of the eight (8) planned modules are in the development process
- The risk assessment course will be planned next.



Comparing Antoine parameter sources for accurate vapor pressure prediction across a range of temperatures

Puleng Moshele¹ Mark R. Stenzel² Daniel Drolet³ Susan F. Arnold^{1,*}

¹Division of Environmental Health Sciences, University of Minnesota School of Public Health, 420 Delaware St. SE, Minneapolis, MN 55455

²Exposure Assessment Solutions, LLC, 6045 N 27th St. Arlington, VA 22207, United States

³Department of Environmental and Occupational Health, School of Public Health, Université de Montréal, Montreal H3T 1A8, Canada

*Corresponding author: School of Public Health, University of Minnesota, 1226 Mayo Memorial Building, 420 Delaware St. SE, Mayo Mail Code 807, Minneapolis MN 55455, USA. Email: arnol353@umn.edu

Abstract

Determining the vapor pressure of a substance at the relevant process temperature is a key component in conducting an exposure assessment to ascertain worker exposure. However, vapor pressure data at various temperatures relevant to the work environment is not readily available for many chemicals. The Antoine equation is a mathematical expression that relates temperature and vapor pressure. The objective of this analysis was to compare Antoine parameter data from 3 independent data sources; Hansen, Yaws, and Custom data and identify the source that generates the most accurate vapor pressure values with the least bias, relative to the referent data set from the CRC Handbook of Chemistry and Physics. Temperatures predicted from 3 different Antoine sources across a range of vapor pressures for 59 chemicals are compared to the reference source. The results show that temperatures predicted using Antoine parameters from the 3 sources are not statistically significantly different, indicating that all 3 sources could be useful. However, the Yaws dataset will be used in the SDM 2.0 because the data is readily available and robust.

Key words: Antoine equation; exposure assessment; vapor pressure.

InTERACCT

Interdisciplinary Training, Education and Research Activities for
Assessing and Controlling Contaminants from Emerging Technologies



Aim 2 Research Experiences

Two PhD students at the U of Minnesota have received support.

Research experiences are directly related to the themes of InTERACCT:

1. Chemical properties that influence exposure (published)
2. Risk assessment methods used in industrial hygiene research (submitted)

InTERACCT

Interdisciplinary Training, Education and Research Activities for Assessing and Controlling Contaminants from Emerging Technologies

ONE-WEEK INTENSIVE
SUMMER EXPERIENTIAL
LEARNING OPPORTUNITY

June 3-7, 2024

University of Minnesota Twin Cities



Learn more and
apply today!



SCAN ME

Application Deadline:
March 22, 2024

To increase awareness of Industrial Hygiene/Occupational Health (IH/OH) as a career, InTERACCT is offering a one-week onsite summer intensive experiential learning opportunity for a small group of qualified undergraduate juniors and seniors. **Enrolled participants receive a stipend up to \$800.**

The week will provide **technical and leadership training and hands-on experience** in the industrial hygiene lab facilities on the University of Minnesota Twin Cities campus. Courses will be **taught by experts in the field** from the University of Minnesota, University of Iowa, and UCLA.

Job shadowing opportunities may be available.

Benefits:

- » On-site training and lab experience with experts in the field.
- » Networking opportunities with practicing professionals in emerging technologies in industrial hygiene.
- » Off-site field trip
- » Room and board on University of MN Twin Cities campus

Eligibility:

- » Undergraduate junior or senior currently enrolled in a STEM program. *Priority consideration given to underrepresented minority students.*
- » Academic standing: GPA of 3.0 or greater



Funding for the Interdisciplinary Training, Education and Research Activities for Assessing and Controlling Contaminants from Emerging Technologies (InTERACCT) is provided by the National Institute of Environmental Health Sciences (NIEHS), R25ES033035.

QUESTIONS: interacct@umn.edu

LEARN MORE: essi.umn.edu/interacct-summer

Aim 2 Summer Program

Focus on pipeline development to increase diversity in master's programs

Course features:

- Hands-on activities in the lab,
- Field trips,
- Meeting graduate students and professionals,
- Learning about graduate school, and
- Leadership training.

InTERACCT

Aim 3: Extending Reach

Continuing Education

Currently adapting content into two continuing education courses:

- Structured Deterministic Module
- Data and SEGs

Academic Programs

- Use in flipped-classroom instruction at the respective institutions
- Promotion to other institutions

Evaluation Findings

Strengths

- Positive team dynamics
- Useful learning for team
- Challenges have been acknowledged, leading to improved performance over time

Areas for Improvement

- Clarifying roles and priorities
- Master checklists for tasks and hand-offs
- Modify meeting schedule and agendas

It was a challenge to develop a workflow and technology system that met everyone's needs...



*In*TERACCT

Interdisciplinary Training, Education and Research Activities for
Assessing and Controlling Contaminants from Emerging Technologies

essi.umn.edu/interacct

interacct@umn.edu