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Workshop 3:
Making The Most Of Near Field Exposure Modeling For Diverse Occupational Risk Assessment

June 29, 2023
11:00 am-1:00 pm EDT

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Moderator Introduction

- Andrew Maier, MS, PhD, CIH, DABT, Fellow AIHA
  - Director of the OARS WEEL Committee
  - Principal Health Scientist at Stantec ChemRisk
  - Former IH in petrochemical industry, associate professor at University of Cincinnati
  - NIOSH Toxicology Fellow

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Many Paths, One Goal – Protecting Worker Health

- The goal is to enhance the understanding and appreciation of others' approaches so that each one can leverage insights and data generated by others to most effectively meet their needs.

- Key topics to be covered include identifying data and assessing quality, exposure models, dermal exposure assessment, and risk characterization and management.

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Click Here for AIHA Workshop Webpage

Disclaimer

- We are conducting this meeting under the Chatham House Rule. We understand that there might be members of the press in the audience. Audience members are free to use the information received during the workshop, but we ask that neither the identity nor the affiliation of any speaker be attributed to specific information.

- Speakers and panel members are sharing their individual expertise and not representing their employer or other organizations with which they are affiliated.

Workshop Logistics

- Everyone is on mute except for speakers and discussants.
- The chat is disabled.
- Please use the Q&A function to submit any questions or comments during the workshop for follow up by the moderator.
- There will be poll questions later in the program that will appear as a pop-up box. Please participate!
- An evaluation will be available when the workshop ends.
- If you experience technical difficulties, please email Schubert_Fabros@americanchemistry.com

Workshop Hosts

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Workshop Agenda

Time	Topic	Presenters
11:00 am - 11:05 am	Opening remarks	Andy Maier
11:05 am - 11:20 am	Speaker presentation	Kenny Unice
11:20 am - 11:55 am	Speaker presentation	Elke Jensen
11:55 am - 12:00 pm	Break	
12:00 pm – 12:50 pm	Discussion and Audience polls	Facilitated Discussion
12:50 pm - 12:55 pm	Q&A	Speakers & Discussants
12:55 pm - 1:00 pm	Next Steps	Andy Maier

Opportunity and Challenge Statement

Exposure modeling can be a valuable tool in occupational risk assessment.

Many considerations

- Model availability and design
- Model applicability and use
- Data quality and availability
- Model optimization and evaluation
- Informed risk decision making

Workshop Topics

- Exposure Model Applications and Limitations
- Linking Exposure Models to Intended Use
- Integrating Exposure Information

Speakers and Discussants

Speakers

- Kenny Unice, M.S.
- Elke Jensen, Ph.D.

Discussants

- Barry Graffeo, CIH, FAIHA
- Mike Jayjock, Ph.D., CIH
- Yuh-Chi Niou, M.S., CIH, CSP
- John Wambaugh, Ph.D.

Meet the speaker

Kenny Unice, MS
Principal Health Scientist
Stantec

- 23 years of consulting experience in occupational and environmental chemical fate and transport
- Co-authored published studies with near-field assessments of petroleum & hair-spray products as well as studies of consumer product emissions; developed occupational exposure assessment approaches under REACH and TSCA.
- Expertise in mass transfer conceptual models in biological, occupational and environmental settings.
- Career emphasis on publishing innovations in applied exposure assessment and/or toxicokinetic methodologies for emerging chemistries including beryllium, cobalt, formaldehyde, NMP, PFOA, and tire and road wear particles.

Occupational Exposure Seminar Series – Session 3: Why Model the Near-Field?

Kenny Unice, MS

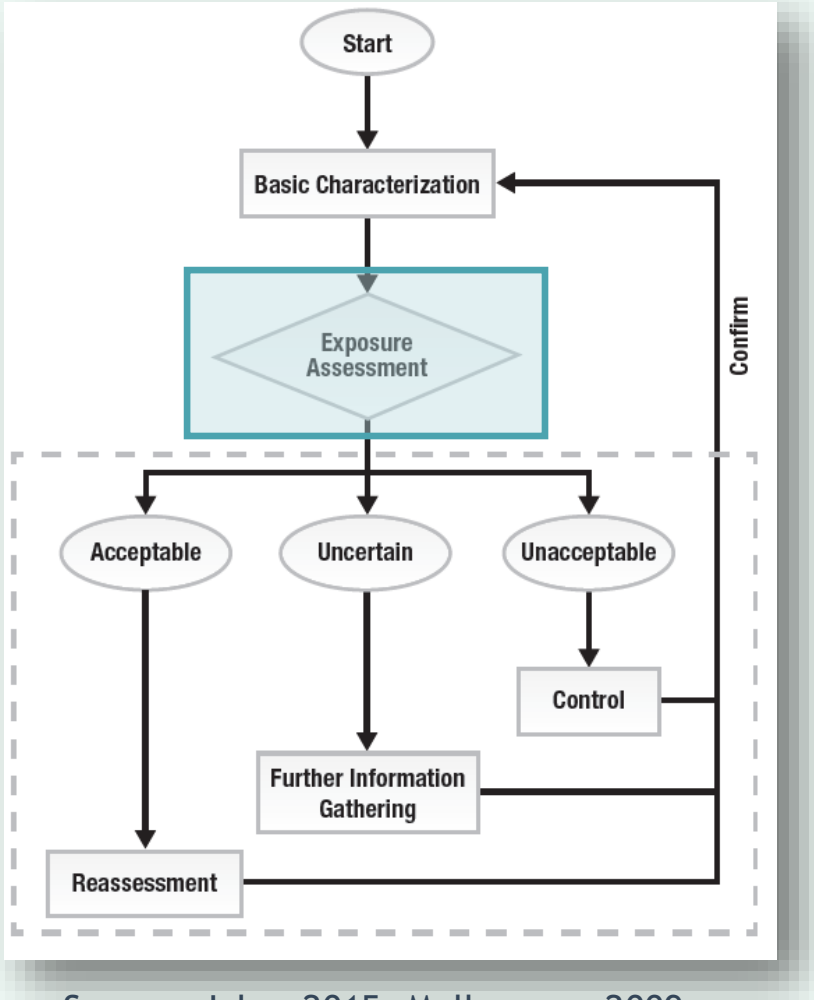
Stantec, Pittsburgh, PA

Learning Objectives

1. Define occupational exposure modeling using non-technical language
2. Understand how models enhance the flexibility, efficiency and refinement of occupational exposure assessments
3. Describe barriers to use of exposure modeling for worker safety and strategies to increase use and acceptance
4. Be knowledgeable about fundamental exposure modeling concepts using near-field modeling frameworks as a case study

Exposure Assessment Paradigm

- Pragmatic conceptual model for health hazard evaluation & control
- Systematic & comprehensive
- Cyclic and tiered approach for improvement
- Categorizes exposures as acceptable, needing more study, or unacceptable
- Represents a type of model already used in EHS!



Source: Jahn, 2015; Mulhausen, 2009

Industrial Hygiene is a Modeling Profession

Adapted from: Jayjock et al. 2009

What is an Exposure Model?

"Simplification of reality that is constructed to gain insights into select attributes" of exposure pathways

Purpose

- Assess what happened
- Forecast what will happen

Framework for models

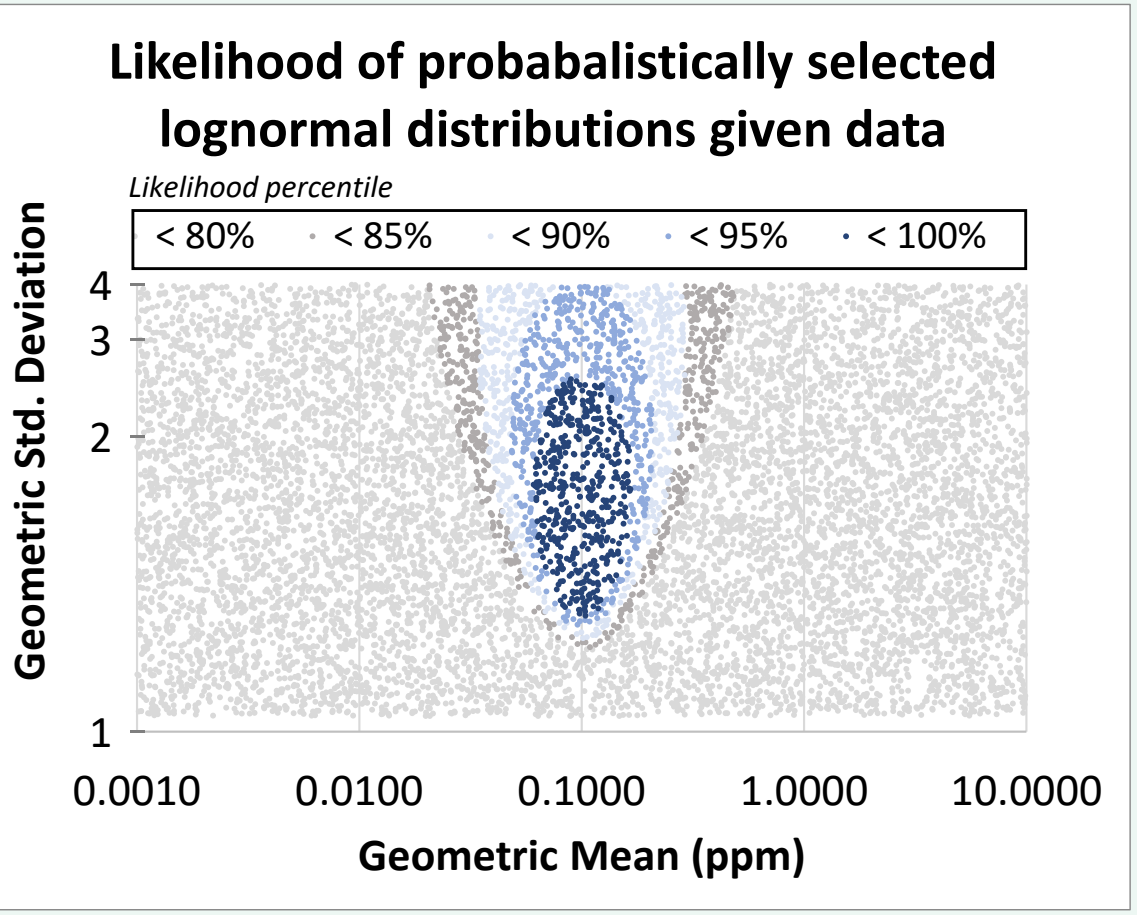
- Fundamental principles of biology, chemistry and physics
- Can be conceptual rules of thumb; qualitative or quantitative

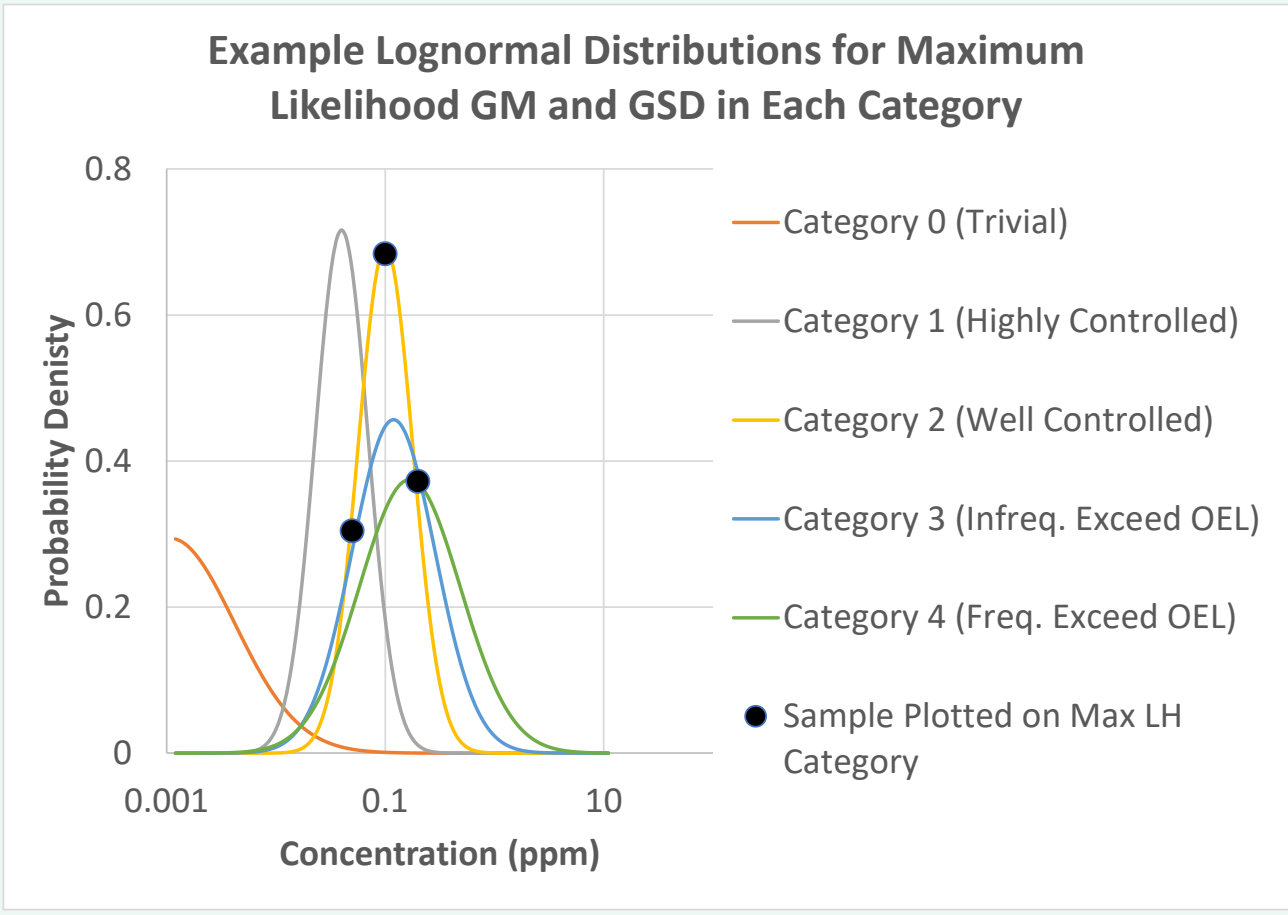
Steps

- Model development
- Model evaluation
- Model application

Adapted from: U.S. EPA, 2009; Jayjock et al. 2009

Models Help Visualize Mental Maps





Visualization of example presented in Hewett et al. 2006

Model Barriers and Benefits

Acknowledging barriers to quantitative IH modeling

Currently only a small community of IH & EHS math champions

Perceptions of overwhelming complexity

Poor trust of simplified conceptual reality versus measured tangible reality

Discomfort answering stakeholder questions or explaining algorithms

Realizing future benefits of quantitative IH modeling

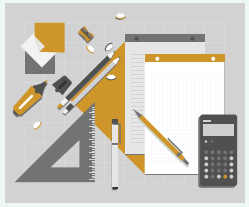
Start with simple scenarios gain expertise incrementally

Collaborate with colleagues w/ beginning, intermediate and expert-level knowledge

Support innovative teaching strategies to challenge viewpoints of models as “mysterious, difficult or daunting”

Adapted from: Jayjock et al. 2009

Tiered Approach to Learning Models

Guidance or Framework (Reference)	Tier 1 Model (screening level)	Tier 2 Model (intermediate level)	Tier 3 Model (advanced level)
Learning Journey Stages	Beginner 	Practitioner 	Expert 
USEPA (2016)	Deterministic	Refined deterministic/ mechanistic	Probabilistic
ECHA (2016)	Conservative and potentially generic	Higher tier refined and typically task specific	Exposure measurements potentially paired with models
Industrial Hygiene Literature (Arnold et al. 2009; Jayjock 2011).	Worst case or simple models	Complex or mechanistic modeling	Complex mechanistic modeling with probabilistic inputs and outputs

Adapted from: Allen Hewett 2022 AIHA Seminar Series

Near-Field Modeling Concept

Real world

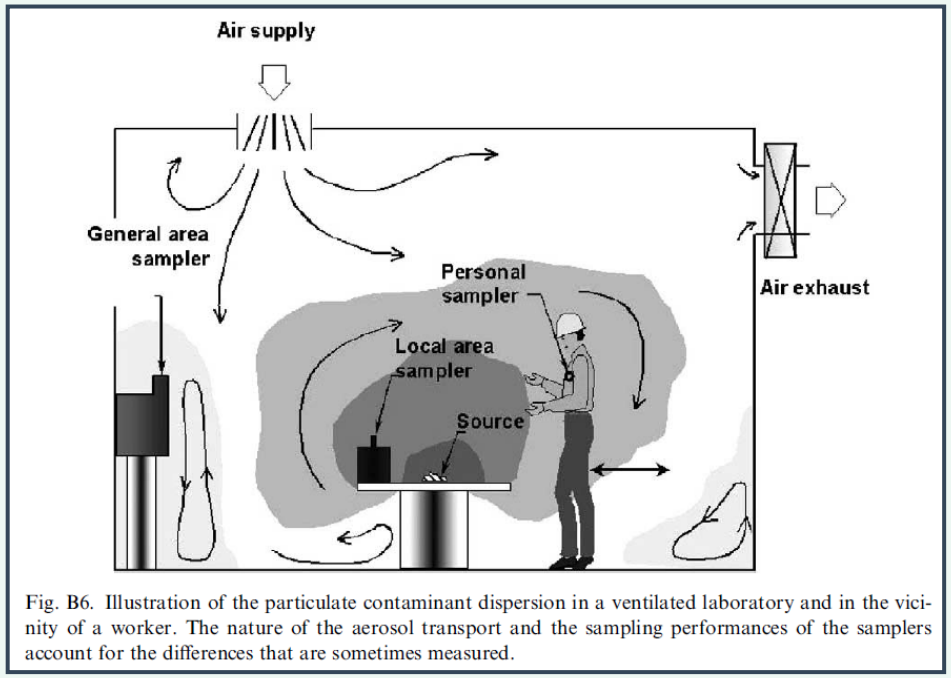


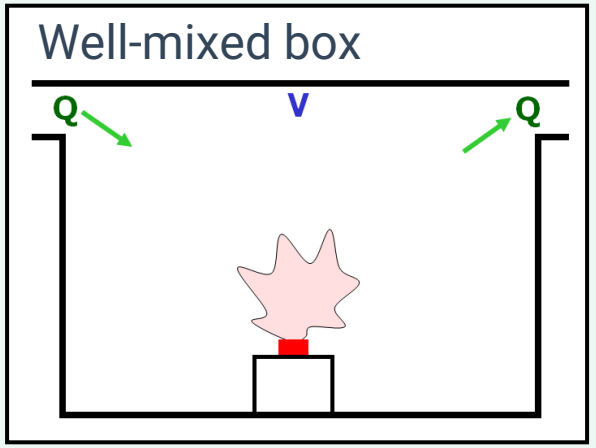
Fig. B6. Illustration of the particulate contaminant dispersion in a ventilated laboratory and in the vicinity of a worker. The nature of the aerosol transport and the sampling performances of the samplers account for the differences that are sometimes measured.

ICRP (2002): Supporting Guidance 3 Annex B

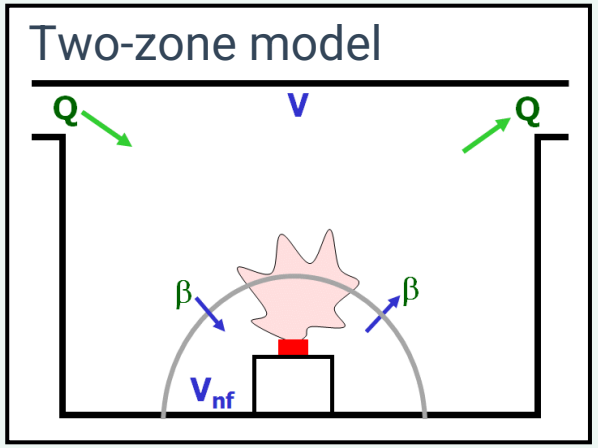
Adapted from: Allen Hewett 2022 AIHA Seminar Series

Model Tiers Also Follow Learning Journey Stages

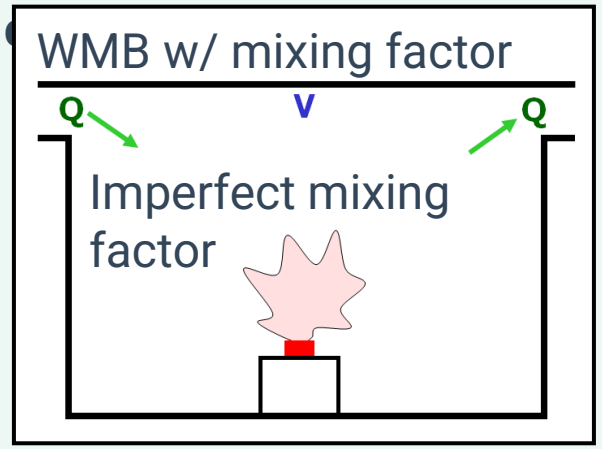
Tier 0 (w/ implausible Q, V))



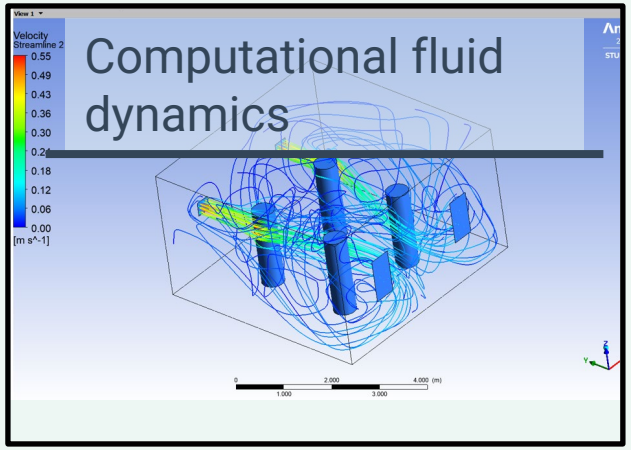
Tier 2 (w/ plausible cond.)



Tier 1 (w/ upper bound)



Tier 3 (w/ plausible cond.)



Hemeon's 1963 Plant and Process Ventilation

Historical State of Art (e.g. Hemeon 1963)

PLANT AND PROCESS VENTILATION

by

W. C. L. HEMEON

Director, Hemeon Associates, Air Pollution Research Engineers, Pittsburgh, Pa.

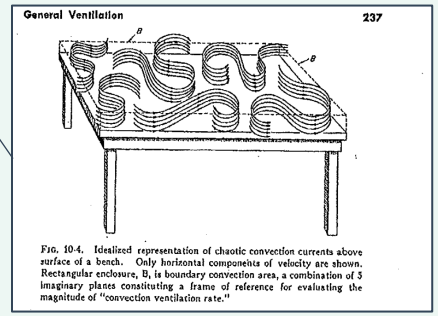
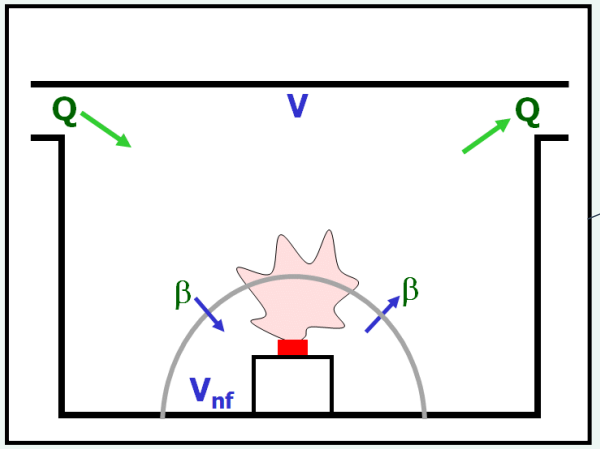


FIG. 10-4. Idealized representation of chaotic convection currents above surface of a bench. Only horizontal components of velocity are shown. Rectangular enclosure, B, is boundary convection area, a combination of 5 imaginary planes constituting a frame of reference for evaluating the magnitude of "convection ventilation rate."

The evaporation of solvent from a point source on an infinite plane would result in a B.C.A. that is hemispherical in shape, provided we assume equal dispersion of vapor in all directions from the source. The assumption is incorrect for there is, in fact, a tendency for flattening of the surface that is the locus, close to the source, due to the slightly greater density of the air-vapor mixture. (The cooling effect of the evaporating solvent, and the presence of higher solvent vapor content of the mixture account for this condition.)

The simplification, however, leads to a mathematical treatment that is simple and therefore practical for application to design problems. The nature of the inaccuracies is satisfactory because they lead to conservative conclusions.

Current Practice



Process Safety and Environmental Protection 149 (2021) 537–556

Contents lists available at ScienceDirect

Process Safety and Environmental Protection

journal homepage: www.elsevier.com/locate/psep

A traditional Near Field-Far Field approach-based model and a spreadsheet workbook to manage Oxygen Deficiency Hazard

Elena Stefana[a,*], Filippo Marciano[a], Daniel Drolet[b], Thomas W. Armstrong[c]

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[b] Volunteer EASC, American Industrial Hygiene Association, Longueuil, J4G 2S4, Quebec, Canada
[c] TWASHR Occupational Hygiene Consulting, LLC, 205 Woodstock Lane, Branchburg, NJ, 08876, USA

"…more suitable than the well-mixed room approach for simulating exposure concentrations resulting from proximate sources, and is computationally more tractable than CFD models"

Complexity Depends on Lens of Perspective

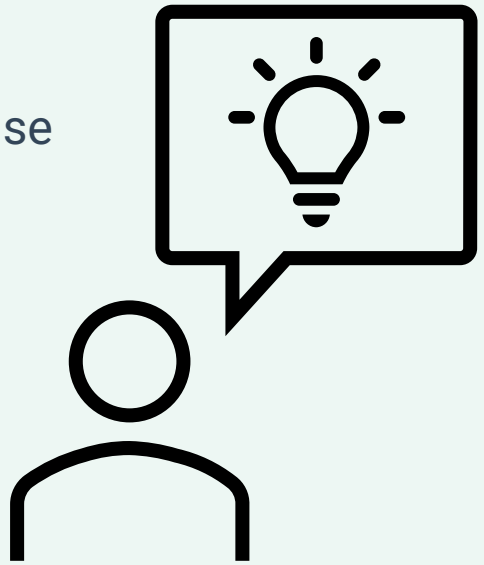
Excerpt from: Stefana et al. 2022

$$n_{O2,NF}(t) = n_{O2,NF}(t-\delta t) + n_{O2,ig}(t-\delta t,t) + n_{O2,\beta,inNF}(t-\delta t,t) - n_{O2,\beta,outNF}(t-\delta t,t) + n_{O2,air}(t-\delta t,t)$$

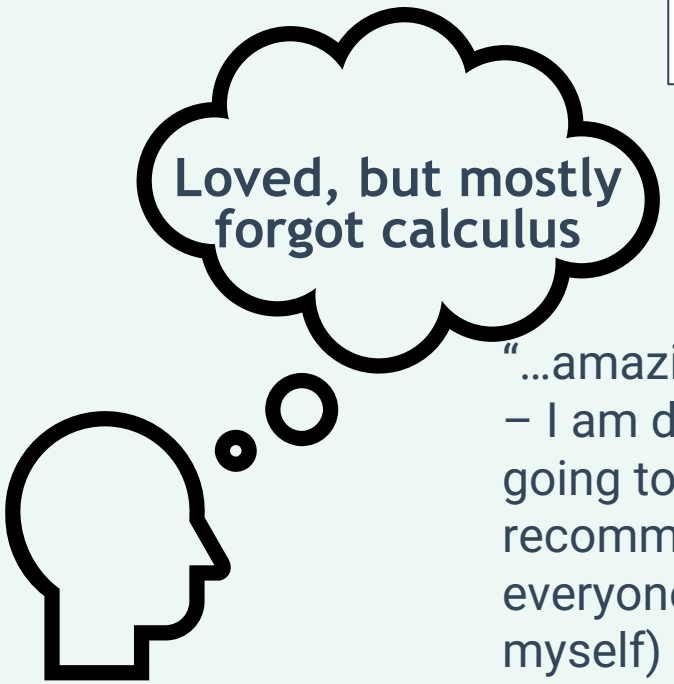
$$n_{O2,ig}(t-\delta t,t) = \sum_{s=1}^{S}\sum_{j=1}^{J}\sum_{i=1}^{I}\left\{ k_{s,i}\frac{p_{ig}(t-\delta t)\varphi_{O2,ig:s,i}\int_{t-\delta t}^{t}\dot{Q}_{ig:s,j,i}(t)dt}{RT_{ig}(t-\delta t)}\right\}$$

"…that mass balance is so satisfying - I simply must use this approach (spoken with intensity)!"

Loved calculus



Loved, but mostly forgot calculus

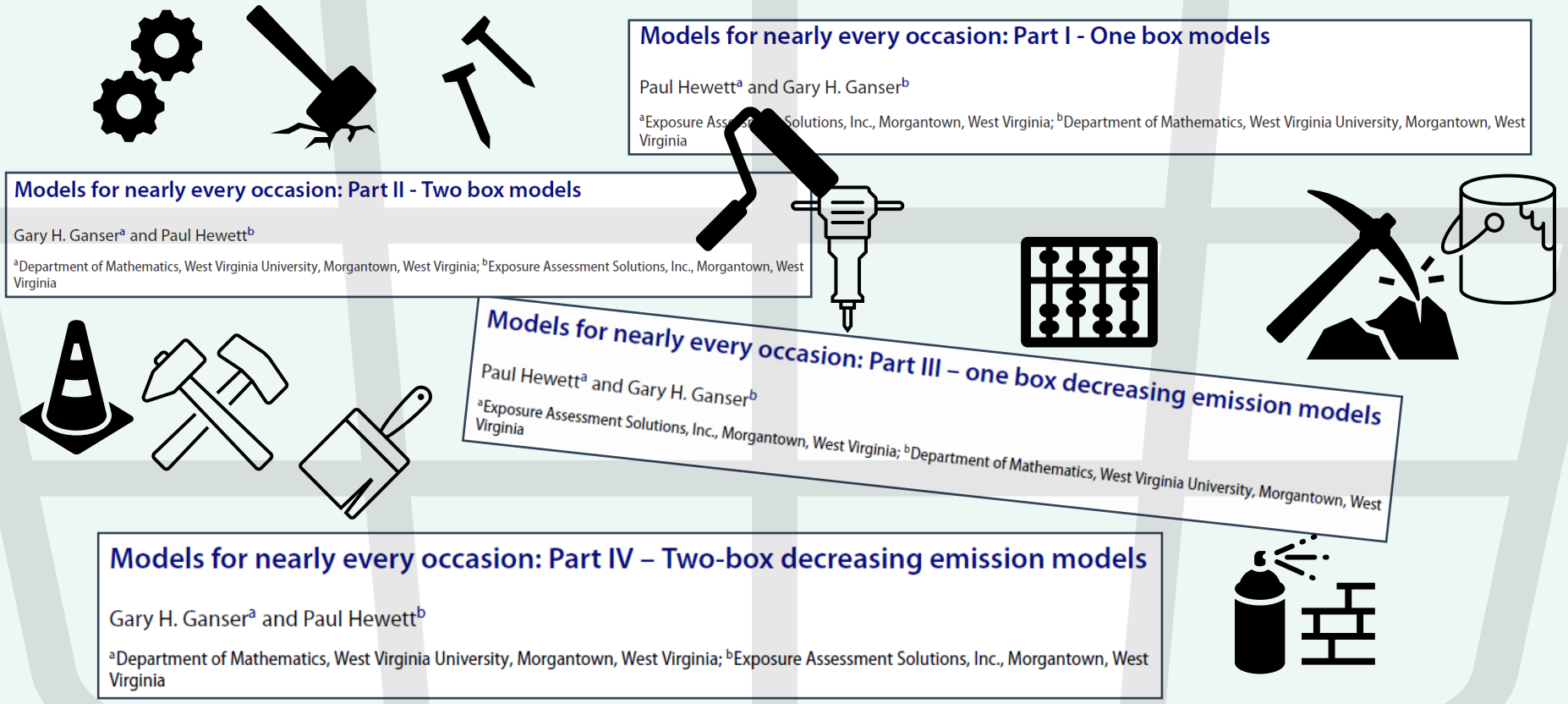


"…amazing work – I am definitely going to recommend everyone (except myself) use this approach!"

Calculus? I haven't been to the dentist in ages!

Measurement Island

Near-Field Modeling Toolbox



Frequently Used NF Models

Model	Principle
Advanced Reach Tool (ART) v 1.5	Mechanistic tool w/ Bayesian measurement updates
Stoffenmanager v 8	Knowledge-based tool
European Centre for Ecotoxicology and Toxicology of Chemicals Targeted Risk Assessment (ECETOC-TRA) v 3.1	Knowledge-based tool
Chemical Screening Tool for Exposures and Environmental Releases (ChemSTEER) v 3.2	Screening-level mass balance tool
IH Mod 2.0	Mass balance tool
Task Exposure Assessment Simulator (TEAS) v 1.0	Mass balance w/ probabilistic prediction tool

Closing Thoughts

Exposure Models...

- already implemented by every IH and EHS professional ever
- predict what might happen or help understand what did happen
- will greatly benefit society if supported by educational strategy

Suggested Innovations…

- corporate investment in talent pipeline of modeling experts in anticipation of artificial intelligence disruption
- communication of “success stories” of synthesized professional knowledge, measurements, and multiple tiers of models
- training and guidance on model selection and advanced Bayesian and other probabilistic techniques

Meet the speaker

Elke Jensen, PhD
Product Sustainability Consultant - Risk Assessment
The Dow Chemical Company

- > 20 years experience in product safety and risk assessment in government and private sector
- Conduct exposure and risk assessments to support product safety, compliance, and product stewardship
- Experience in quantitative exposure modeling
- Serve as a credible technical resource within Dow and externally with professional, scientific, and government organizations

OVERVIEW

Model selection considerations

1. Fit for purpose
2. Domain of Applicability (chemical)
3. Confidence and uncertainty
4. Acceptance (intended audience)

A closer look at models used in regulatory frameworks, their key features and application

1. TSCA inhalation models
2. REACH inhalation models

MODEL SELECTION CONSIDERATIONS

1. FIT FOR PURPOSE

- Problem formulation – Will the model answer the question that is being asked ?
- Scenario applicability - Does the model apply to the scenario being evaluated?
- Route of exposure – Does the model assess the relevant route of exposure?

2. DOMAIN OF APPLICABILITY

Does the model "cover" the chemical being evaluated?

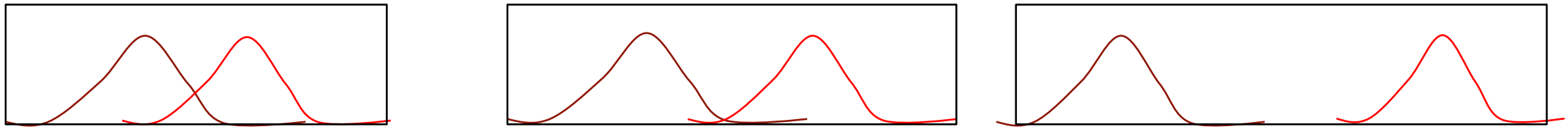
For example

- Physical form
  - Liquid vs Gas vs Solid vs Aerosol vs Fibers vs Nano …
- Organic vs Inorganic / Metals vs UVCB
- Discrete vs Polymer
- Ionizable vs non-ionizable
- …

3. CONFIDENCE

What is the decision context?

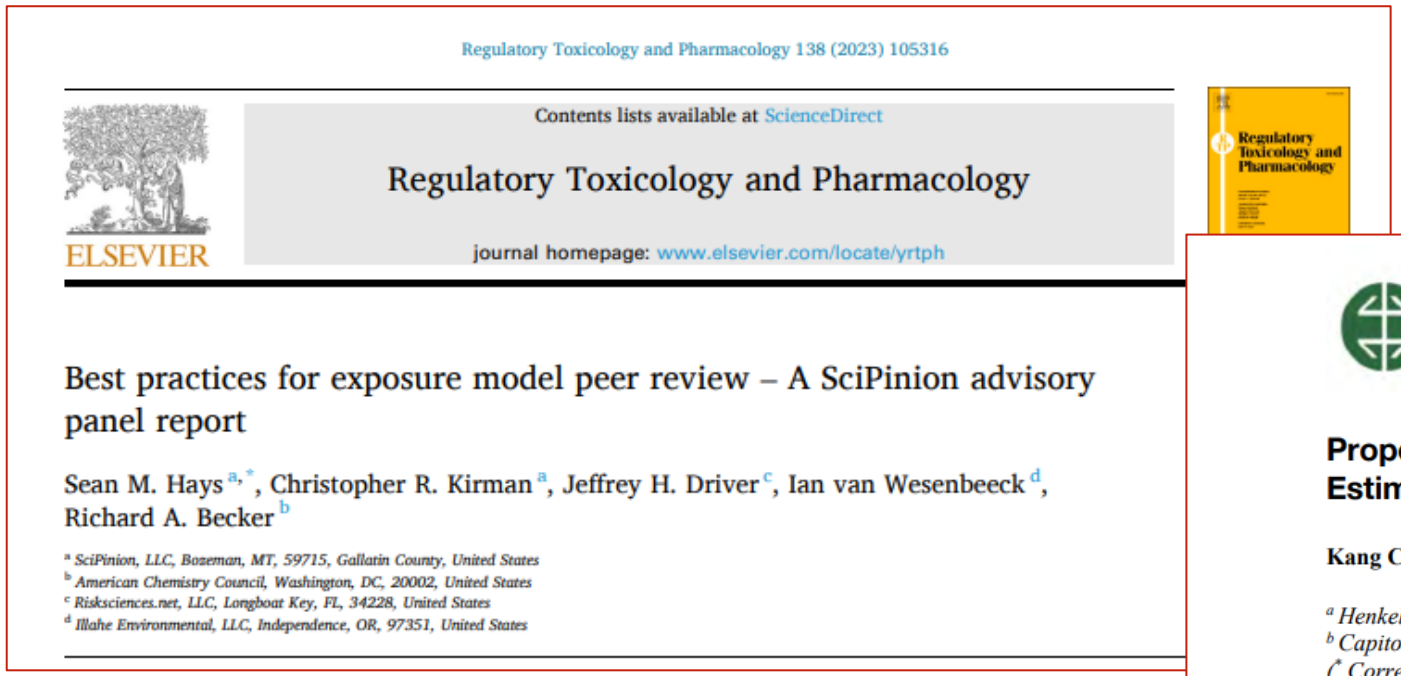
What is the uncertainty? Is it sufficient for my purpose?



Prioritization → screening → risk assessment → risk management

INCREASING ACCURACY, INFORMATION NEEDS

CONFIDENCE – CONT'D



Regulatory Toxicology and Pharmacology 138 (2023) 105316

Contents lists available at ScienceDirect

Regulatory Toxicology and Pharmacology

journal homepage: www.elsevier.com/locate/yrtph

Best practices for exposure model peer review – A SciPinion advisory panel report

Sean M. Hays [a,*], Christopher R. Kirman [a], Jeffrey H. Driver [c], Ian van Wesenbeeck [d], Richard A. Becker [b]

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[d] Illahe Environmental, LLC, Independence, OR, 97351, United States

The Chemist
Journal of the American Institute of Chemists

Proper Selection and Application of Mathematical Models for Estimating Occupational Exposure to Chemicals

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https://doi.org/10.1016/j.yrtph.2022.105316

https://www.theaic.org/pub_thechemist_journals/Vol-92-No-1/Vol-92-No1-Article-10.pdf

CONFIDENCE – CONT'D

Sources of uncertainty

- Scenario – what is known about the activity
- Model uncertainty – how well can the model account for factors that influence exposure
- Inputs – how much confidence in the model parameters

See for example, Guidelines for Human Exposure Assessment Risk Assessment Forum (epa.gov)

4. ACCEPTABILITY

Will the answer be accepted by the intended audience?

Shared goal to protect worker health and safety

- Industrial Hygiene/Product stewardship
  May have more familiarity with specific setting, practices
- Regulatory risk assessments
  - May have statutory / regulatory requirements or standards
  - May need to be more “generic”

A CLOSER LOOK AT SOME REGULATORY MODELS…EPA

REGULATORY MODELS - US EPA TSCA

New chemicals – generally lack monitoring data

- Screening

Existing chemicals (Dichloromethane, Carbon tetrachloride, for example)

- Fill data gaps
- Supplement "weak" or biased monitoring data
- Model ONU exposure
- Inform Workplace Chemical Protection Plan (WCPP)

ONU = occupational non-user

REGULATORY MODELS - US EPA

- chemsteer_user_guide.pdf (epa.gov)

ChemSTEER User Guide

Chemical Screening Tool for Exposures and Environmental Releases

Updated: May 2015

- Models for Calculating Inhalation Exposures
  - EPA/OPPT Small Volume Solids Handling Inhalation Model
  - EPA/OPPT Mass Balance Inhalation Model
  - OSHA PEL-Limiting Model for Substance-Specific Particulates
  - OSHA PEL-Limiting Model for Substance-Specific Vapors
  - OSHA Total PNOR PEL-Limiting Model
  - OSHA Respirable PNOR PEL-Limiting Model
  - EPA/OPPT Automobile OEM Spray Coating Inhalation Exposure Model
  - EPA/OPPT Automobile Refinish Spray Coating Inhalation Exposure Model
  - EPA/OPPT Automobile Spray Coating Inhalation Exposure Model
  - EPA/OPPT UV Roll Coating Inhalation Model
  - Near-Field / Far-Field Inhalation Exposure Model
  - User-Defined Inhalation Model

EPA CHEMSTEER MODEL, CONT'D

Near-Field / Far-Field Inhalation Exposure Model

Model Description

This model estimates inhalation exposures of a volatile chemical in two zones: the near-field and the far-field. This is done because contaminant levels in the near-field are considered to provide a better representation of a worker's personal breathing zone than those in the far-field. This model presents estimates for both the near and far-field scenarios, representing workers directly involved in the specific process (near-field) and other workers in the area (far-field).

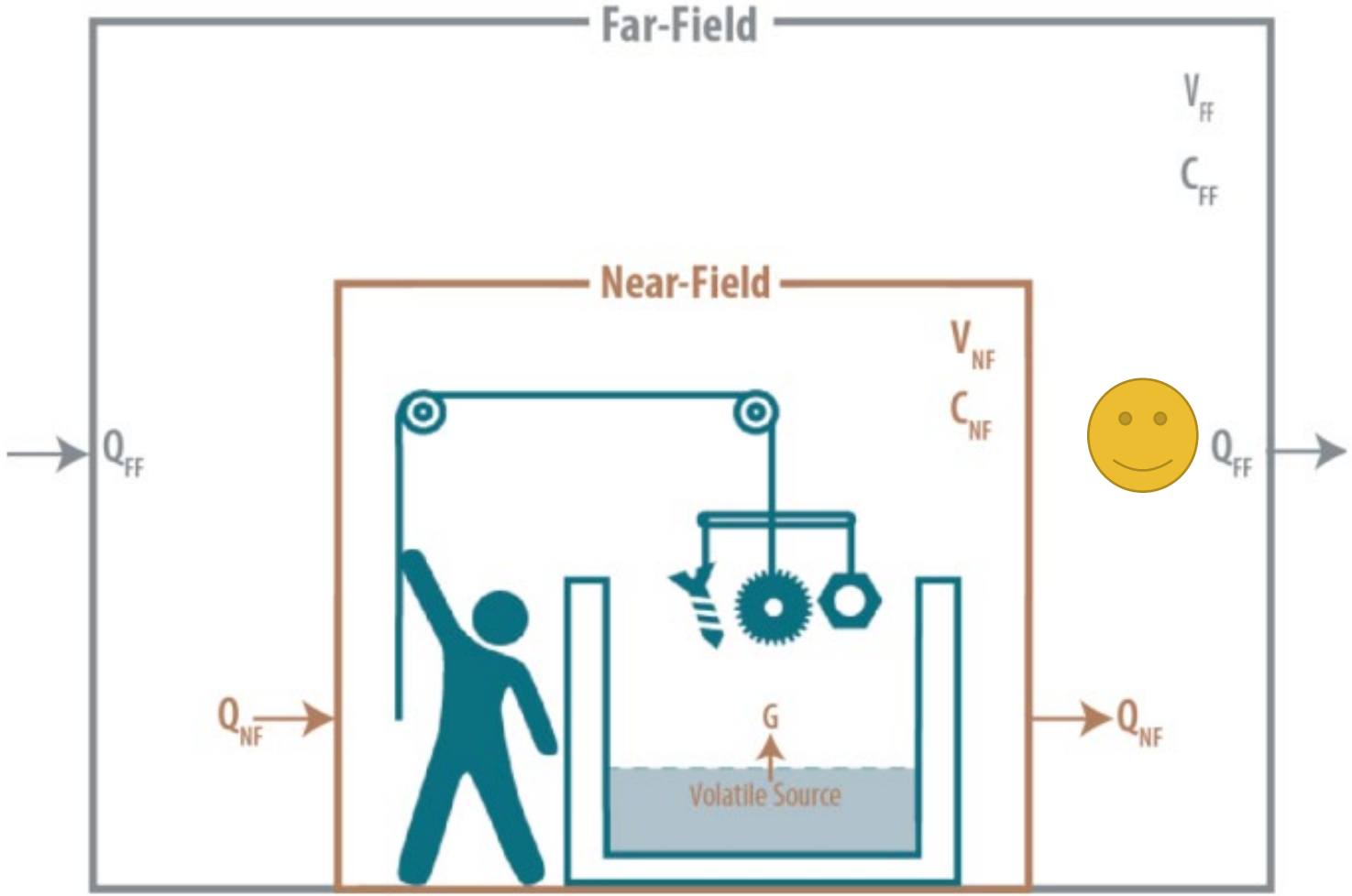
Key Rationale for Model

Keil et al. (2009) developed the Near-Field/Far-Field model to estimate exposure concentrations to volatile chemicals in specific breathing zones. The Near-Field/Far-Field model has been extensively peer-reviewed, is extensively used, and results of the model have been compared with measured data. The comparison indicated that model and measured values agreed to within a factor of about three (Jayjock et al., 2011). This model was applied in the TSCA Work Plan Risk Assessment for Trichloroethylene (EPA, 2014), to estimate worker exposures at vapor degreasing facilities. Default and non-default values for AER, velocity NF, LNF, WNF, HNF were taken from EPA, 2014.

APPLICATION OF EPA MODELS - METHYLENE CHLORIDE

Open-Top Vapor Degreasing

- Near-Field/Far-Field Inhalation Exposure Model
- Uses near-field/far-field approach (AIHA, 2009)



[Risk Evaluation for Methylene Chloride: Supplemental Information on Releases and Occupational Exposure Assessment (epa.gov)]
Figure_Apx F-2

EPA/OPPT Mass Balance Inhalation Model

Model Description

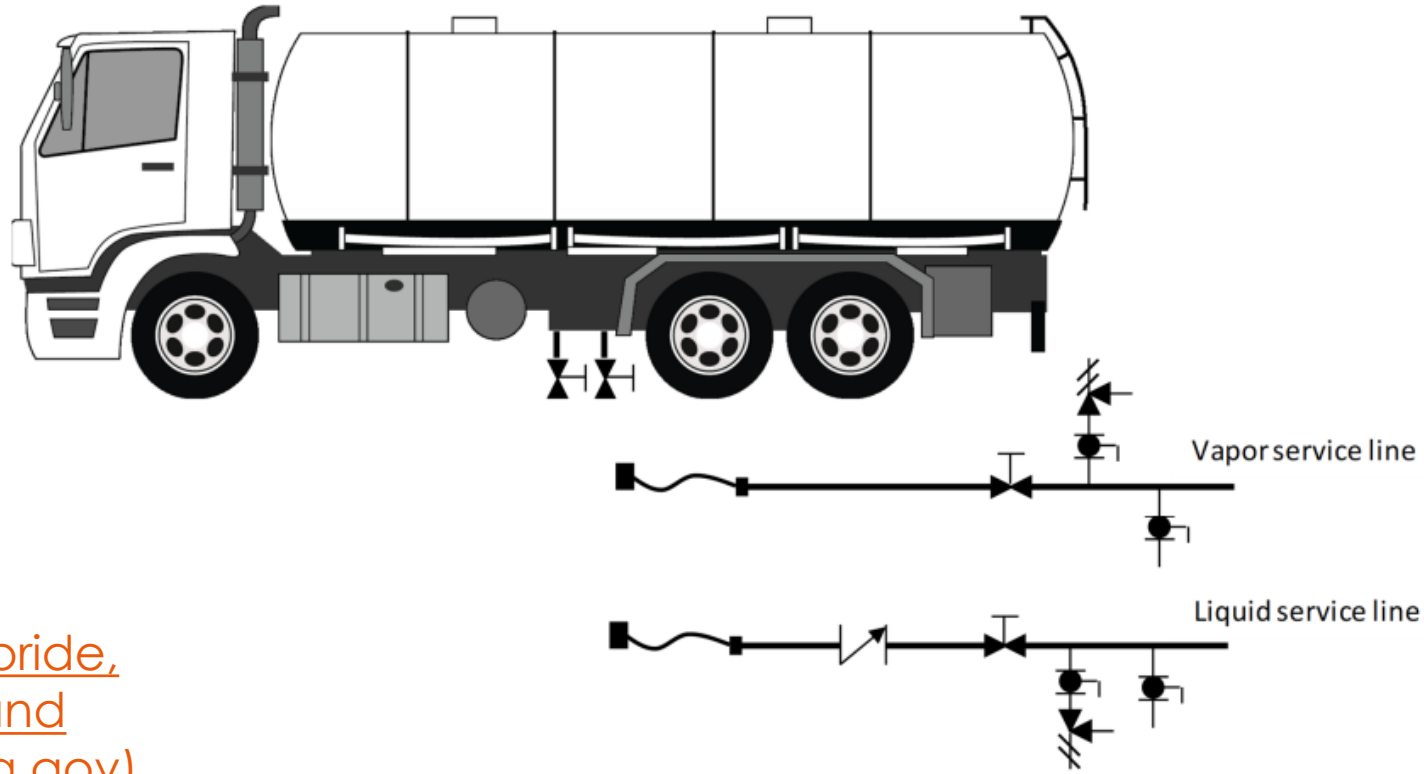
This model estimates the amount of chemical inhaled by a worker (typical and worst case) during an activity in which chemical vapor is generated. Estimation of the concentration for inhalation exposure is based on a vapor generation rate (G) estimated from a release model or from a user-input vapor generation rate. The following release models are vapor generation models:

EPA/OAQPS AP-42 Loading Model	*Displacement from container filling*
EPA/OPPT Mass Transfer Coefficient Model	*Evaporation from open surface (indoor)*
EPA/OPPT Penetration Model	*Evaporation from open surface (outdoor)*
User-Defined Vapor Generation Rate Model	

APPLICATION OF EPA MODELS – CARBON TETRACHLORIDE

Tank truck unloading

- Transfer, disconnect; leaks anc escape of saturated vapor
- EPA/OPPT Mass Balance Mode (AIHA 2009)
- EPA/OAQPS AP-42 Loading Model

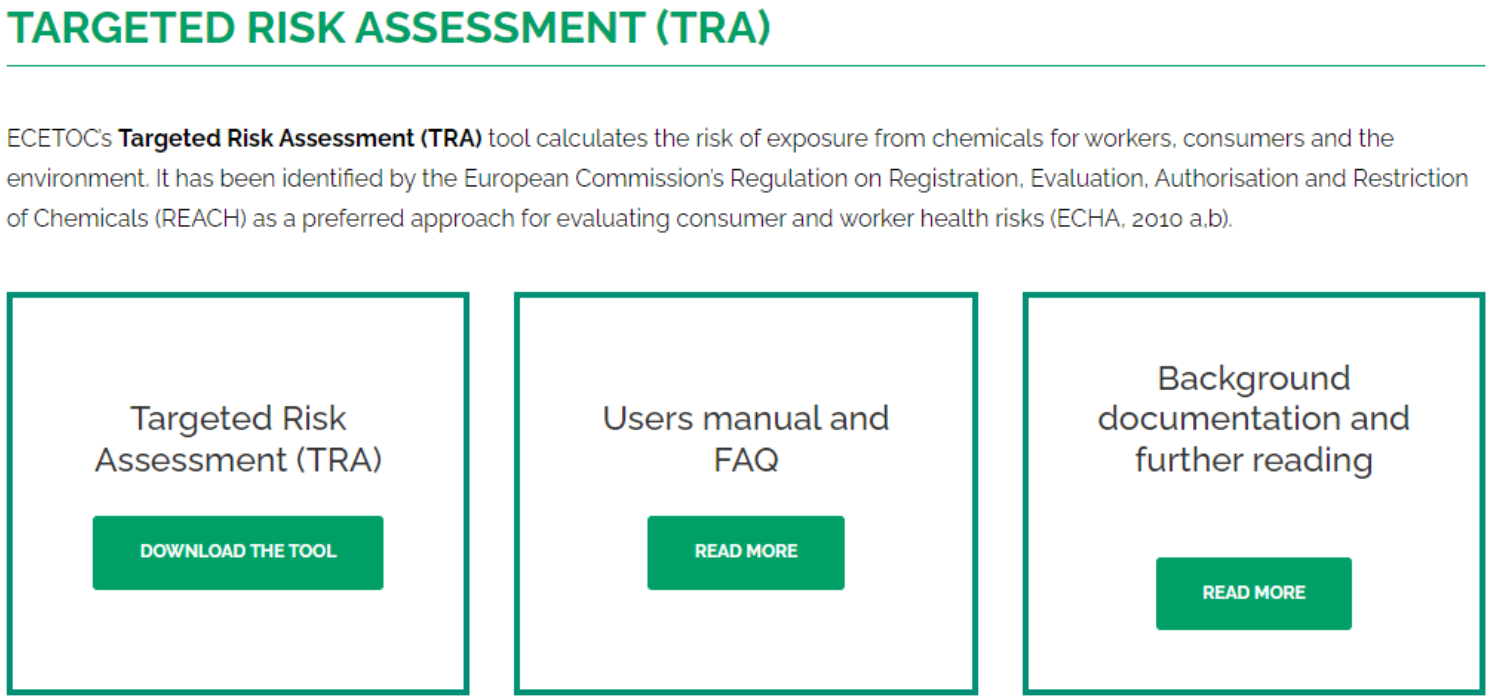


Final Risk Evaluation for Carbon Tetrachloride, Supplemental Information on Releases and Occupational Exposure Assessment (epa.gov)
Figure_Apx D-1

A CLOSER LOOK AT SOME REGULATORY MODELS…REACH

REGULATORY MODELS - REACH

- ECETOC TRA, TRA - Background documentation and further reading - ECETOC
- PROCs
- Banding / statistical



- ECHA R.12-11 defines PROCs and other product or activity codes used for REACh risk assessments

PROC= process code

Table R.12- 11: Descriptor list for Process categories (PROC)

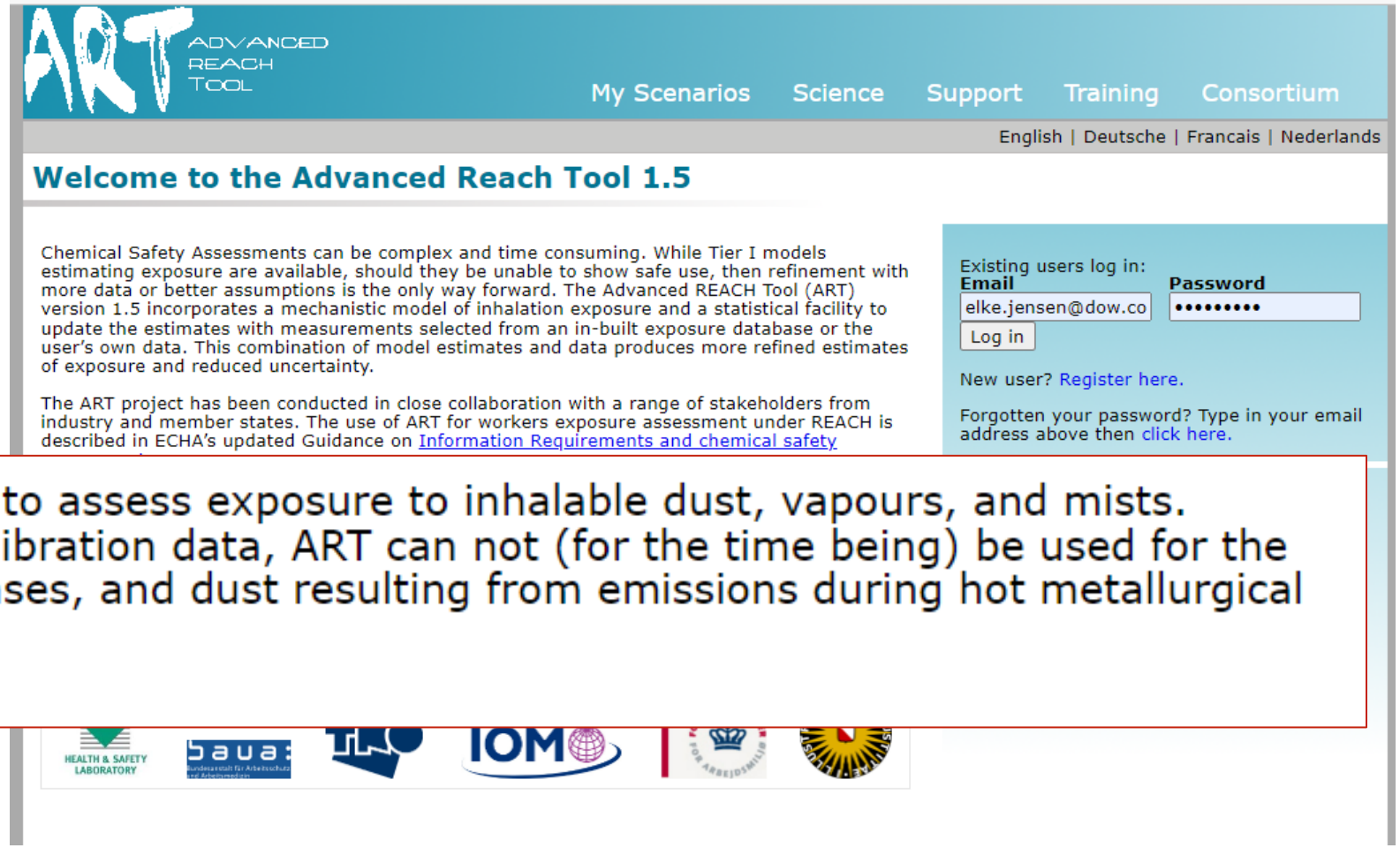
Code	Name	Explanations and examples
PROC1	Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions.	Describes the general nature of processes taking place in sectors where the manufacture of substances or production of mixtures takes place or processes with closed process conditions as applied in chemical industry[25]. The closed transfers inherent to the process including closed sampling are included. Open transfers to charge/discharge the system are not included.
PROC2	Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions	Describes the general nature of processes taking place in sectors where the manufacture of substances or production of mixtures takes place (continuous processes that involve limited manual interventions), or processes with equivalent closed process conditions as applied in chemical industry. The closed transfers inherent to the process including closed sampling are included. Open transfers to charge/discharge the system are not included.

ECETOC TRA, CONT'D

- Monitoring data serves as the basis for "indicative exposures"
  - Industrial vs professional setting
- Banding approach
- User applies exposure modifiers applied to account for
  - Dustiness of solids
  - Duration of exposure (hr/d)
  - Concentration in formulation
  - Air handling (general, enhanced, LEV)
  - Respiratory protection

REGULATORY MODELS - ADVANCED REACH TOOL

- Mechanistic exposure model



ART is currently only calibrated to assess exposure to inhalable dust, vapours, and mists. However, for lack of suitable calibration data, ART can not (for the time being) be used for the assessment of fumes, fibres, gases, and dust resulting from emissions during hot metallurgical processes.

REGULATORY MODELS - STOFFENMANAGER®

- 'Stoffenmanager', a Web-Based Control Banding Tool Using an Exposure Process Model | Annals of Work Exposures and Health | Oxford Academic (oup.com)

Subsequent versions of Stoffenmanager® were further validated and/or compared with other tools in various studies. Meanwhile the validation of the tool is based on more than 7000 measurements. From these studies it can be concluded that Stoffenmanager® is the most balanced, robust and sufficiently conservative tool. With the exception that the exposure to low volatile compounds, released as a result of spraying activities taking place outside without local exhaust ventilation (aerosol formation - PROC11), might be underestimated Tongeren van et al (2017).

Scope

Figure 1. Applicability domain for the quantitative inhalation exposure model

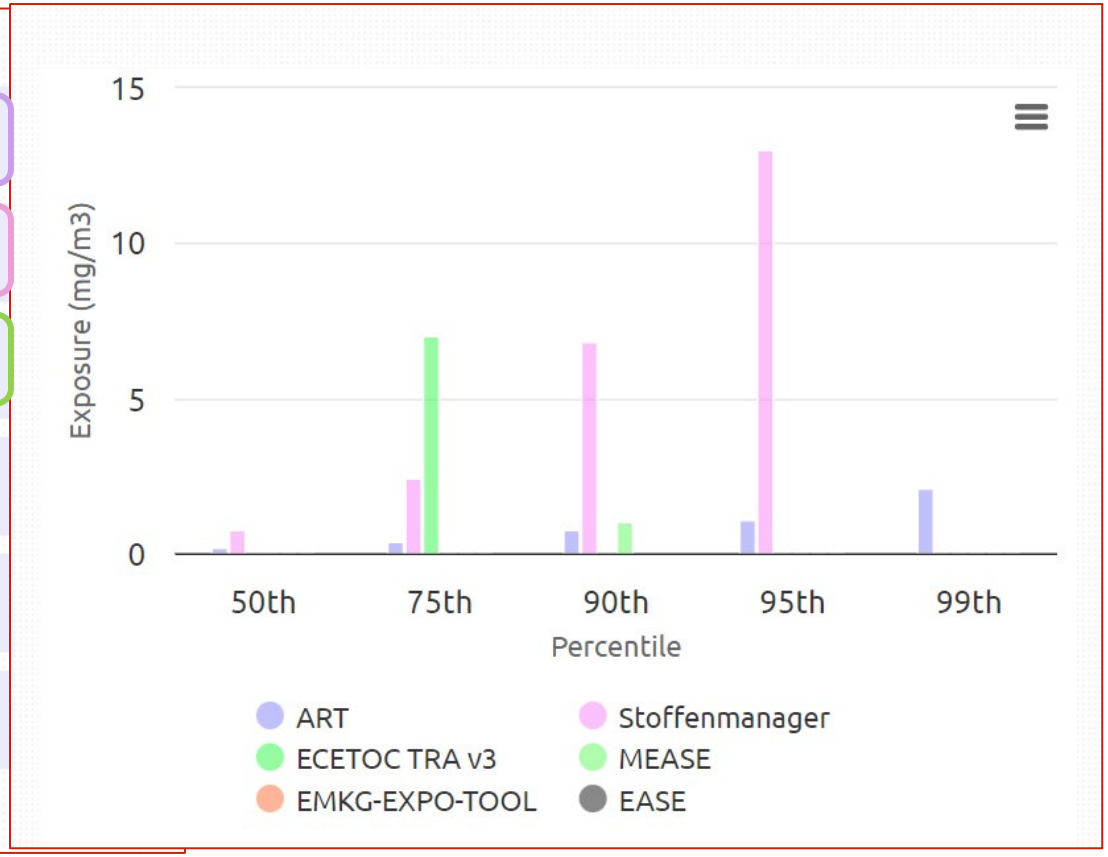
Product / Activity	Gas	Volatile liquids	Non-volatile liquids	Powders	Fibers	Objects
Moving and agitating						n.a.
Gravitational transfer						n.a.
Spreading and immersion						n.a.
Air dispersive techniques			!			n.a.
Welding, soldering and combustion						n.a.
Abrasion and impact: Wood and stone	n.a.	n.a.	n.a.	n.a.	n.a.	
Abrasion and impact: other activities like plastic, glass or metal	n.a.	n.a.	n.a.	n.a.	n.a.	

APPLICATION OF REACH MODELS

- Side-by-side comparison (in TREXMO)

ART P90 (CI 90%):	0.74 (0.14-5.5) mg/m^3
Stoffenmanager* P90:	6.8 mg/m^3
ECETOC TRAv3:	7 mg/m^3
MEASE:	1 mg/m^3
EMKG-EXPO-TOOL:	n.a. mg/m^3
EASE:	n.a. mg/m^3

n.a.: non-applicable ES



TAKE HOME MESSAGES

- A wide variety of models and approaches exist for estimating inhalation exposure in the workplace
- Different models serve to address a variety of purposes (prioritization, screening, risk assessment, risk management)
- Selection of an appropriate model should consider
  - The problem formulation, decision context, and available information
  - The strengths and limitations of the model, including uncertainty
- Modeling is an important tool in the occupational exposure assessment "toolbox" and should complement industrial hygiene expertise, qualitative assessments, and monitoring data collection

THANK YOU

Sponsors: AIHA and FCRI

Organizers: Andy Maier

Session participants

Attendees

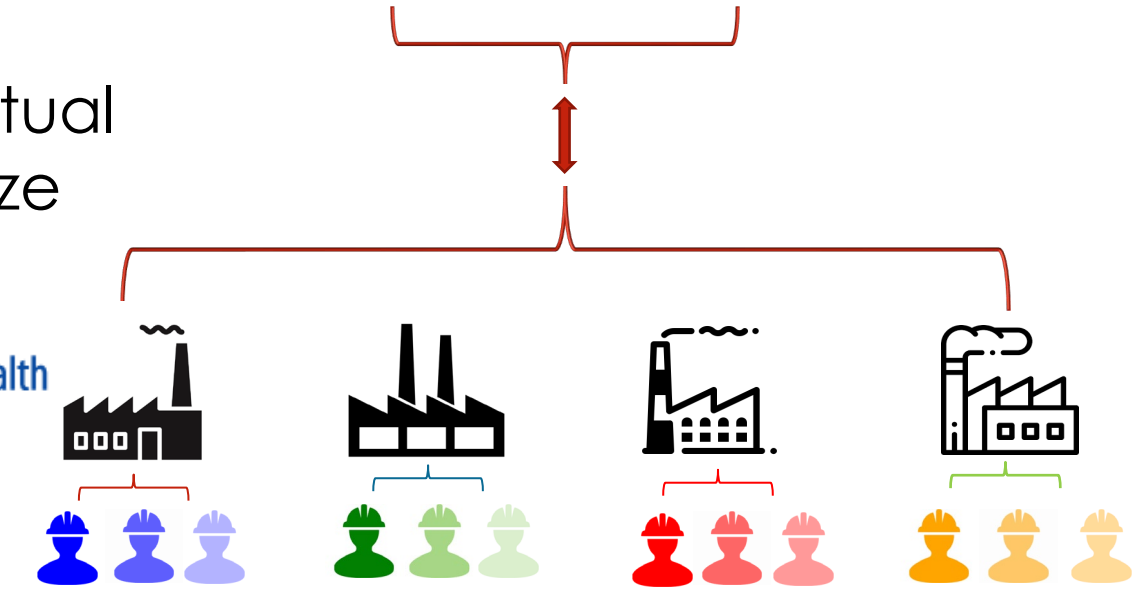
SUPPLEMENTAL INFORMATION

CHEMICALS MANAGEMENT AND IH

Registration/evaluation must be general and broad

opportunities to improve mutual understanding and harmonize approaches

IH is highly specific and difficult to generalize.



For further discussion and analysis, see for example https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9999275/

RE = risk evaluation
RM = risk management
IH = industrial hygiene

SELECTED REFERENCES AND RESOURCES

Evaluation of One- and Two-Box Models as Particle Exposure Prediction Tools at Industrial Scale

TEXAS: a Tool for EXposure ASsessment—Statistical Models for Estimating Occupational Exposure to Chemical Agents

Exposure Models for REACH and Occupational Safety and Health Regulations

Best practices for exposure model peer review - A SciPinion advisory panel report

Exposure Modeling: The Next Generation (aiha.org)

EPA: Considerations When Evaluating Exposure Assessment

OECD Series on Emission Scenario Documents

IHMOD Tool | AIHA

Advanced Reach Tool

https://stoffenmanager.com/en/research/what-is-stoffenmanager/

'Stoffenmanager', a Web-Based Control Banding Tool Using an Exposure Process Model

Mathematical Models for Estimating Occupational Exposure to Chemicals, 2nd edition

ECETOC TRAv3: An In-depth Comparison of Publicly Available Measurement Data Sets With Modelled Estimates of Occupational Inhalation Exposure to Chemicals (April 2023)

TR 140 – Systematic review of published studies of ECETOC TRA Worker exposure predictions (May 2022)

Proper Selection and Application of Mathematical Models for Estimating Occupational Exposure to Chemicals

Schlüter, et al. (2022). Theoretical Background of Occupational-Exposure Models—Report of an Expert Workshop of the ISES Europe Working Group "Exposure Models"

Spinazzè, et al (2017). Accuracy Evaluation of Three Modelling Tools for Occupational Exposure Assessment.

Spinazzè, et al (2019). How to Obtain a Reliable Estimate of Occupational Exposure? Review and Discussion of Models' Reliability.

Strategies for refinement of occupational inhalation exposure evaluation in the EPA TSCA risk evaluation process - PMC (nih.gov)

Guidelines for Human Exposure Assessment Risk Assessment Forum (epa.gov)

Foundation for Chemistry
RESEARCH & INITIATIVES

BREAK

11:55am – 12:00pm

AIHA®
HEALTHIER WORKPLACES | A HEALTHIER WORLD

Workshop Discussants

- Barry Graffeo, CIH, FAIHA
- Mike Jayjock, Ph.D., CIH
- Yuh-Chi Niou, M.S., CIH, CSP
- John Wambaugh, Ph.D.

Discussion Questions

1. What are the advantages of using near field inhalation models in occupational risk assessment? What are the models missing and how can we fill those gaps?

2. What role can models of different types and tiers play in risk assessment? What strategies can we use to increase confidence in model results?

3. How can occupational risk assessors integrate model estimates with other exposure data to inform risk decision making?

Poll Question #1a

How often do you use near-field models in occupational risk assessment?

A. Often
B. Periodically
C. Infrequently
D. Rarely

Poll Question #1b

Which of these models have you used:

A. ChemSTEER
B. IH MOD
C. ART
D. More than one of these
E. None of these

Discussion Question #1

What are the advantages of using near field inhalation models in occupational risk assessment? What are the models missing and how can we fill those gaps?

Poll Question #2a

When selecting a screening model vs. a full model, the most important consideration for me is:

A. Screening models are usually more conservative
B. Screening models are often simpler to run
C. Screening models require less customization
D. I always select full models

Poll Question #2b

In terms of the frequency of using screening vs. full models, I:

A. Use screening more frequently
B. Use full more frequently
C. Use both equally
D. Rarely use either type of model

Discussion Question #2

What role can models of different types and tiers play in risk assessment? What strategies can we use to increase confidence in model results?

Poll Question #3a

What type of data is most often available to you?

A. Empirical
B. Historical
C. Models
D. Some combination of the above

Poll Question #3b

In weighing exposure information (data, operational knowledge and model estimates):

A. Empirical data usually takes highest precedence
B. Model estimates usually take highest precedence
C. All data are considered according to confidence in the information
D. All data are weighed equally

Discussion Question #3

How can occupational risk assessors integrate model estimates with other exposure data to inform risk decision making?

Questions?

Next steps

- The slides will be available to download following the workshop.
  - Please take advantage of the additional resources provided at the end of the presentation slide deck.
- Please complete your evaluation, available immediately following the end of this webinar and by email. Thank you!
- Look for an article in The Synergist covering today's webinar.
- Consider joining us for another workshop in the series:
  - **September 21, 2023:** Dermal Risk Assessment
  - **November 9, 2023:** Risk Characterization and Risk Management

Thank You

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Resources

- Advanced Reach Tool (ART)
- Stoffenmanager (Developed by TNO)
- European Centre for Ecotoxicology and Toxicology of Chemicals Targeted Risk Assessment (ECETOC-TRA)
  - HESI Tables
- Chemical Screening Tool for Exposures and Environmental Releases (ChemSTEER)
- EPA ExpoBox Tools
- IH Mod 2.0
- IH Skin Perm
- AIHA - A Case-Based Introduction to Modeling Occupational Inhalation Exposures to Chemicals
- The Synergist (June/July 2022) - Exposure Modeling: Back to the Future? By Mike Jayjock and Neil Hawkins

AIHA Risk Assessment Tool Kit

- Data Collection tools:
  - IH/OEHS Exposure Scenario Tool (IHEST)
- Basic Characterization tools:
  - Basic Exposure Assessment and Sampling Spreadsheet
- Preliminary/ Initial Exposure Assessment (Tier 1) tools:
  - SDM 2.0
- Refined Assessment (Tier 2) tools:
  - IHMOD
  - IH SkinPerm
  - ODHMOD
  - Dermal Risk Assessment Model (DRAM)
  - FR Assessment Tool
- Refining/ Validation Exposure Assessment tools:
  - IHDA-AIHA
  - ExpoStats
  - IHSTAT
  - IHSTAT Bayes

https://www.aiha.org/public-resources/consumer-resources/apps-and-tools-resource-center/aiha-risk-assessment-tools