Background

The advancement of occupational and environmental health and safety (OEHS) protection depends on the elements of an evolving, self-improving system—that is, cutting-edge research, training, and practical application. As humans in the 21st century will enjoy longer average lifespans than they have at any previous point in history, intervening actions to reduce OEHS risks are critical opportunities to prevent death and disability. In addition, with new materials being introduced to commerce at an ever-increasing pace, identifying populations of workers who are producing and using these new materials will allow us to conduct research on exposures and outcomes and thereby contribute to the technical basis for health protection programs. Our two organizations—AIHA and ACGIH—are comprised of OEHS professionals and academics advocating for the creation and dissemination of the requisite knowledge to take advantage of these opportunities.

Historically, AIHA has lacked a defined process for helping researchers investigate areas of research that have been identified by members and allied stakeholders and supporting the incorporation of results from this research into everyday OEHS practice. The Defining the Science (DTS) Initiative is intended to address this gap.

Purpose of Initiative

AIHA and ACGIH seek to define, manage, and advocate for a standing OEHS research agenda. Through this agenda, our organizations will be able to inform and guide academics, third-party research organizations, volunteer groups, and OEHS practitioners on what research is most critically needed and facilitate the partnerships necessary to accomplish those research goals. Then, we can play better and more integral roles in preparing students and practitioners to conduct research on those essential topics and integrate new findings into their workplace procedures.

For more information, visit AIHA’s DTS Advisory Group webpage.

Methodology

The overall model for DTS is the Practice-to-Research-to-Practice™ model illustrated in Figure 1.
Introducing the DTS Advisory Group

The task of managing the DTS research agenda falls to the DTS Advisory Group (DTS-AG), which has the mission of developing and maintaining a national OEHS research agenda endorsed by the AIHA and ACGIH boards of directors. The DTS-AG is a collaborative venture between AIHA and ACGIH that includes representatives from both organizations.

The advisory group is entrusted with addressing such matters as:

- Identifying areas of practice that do not hold up to current OEHS scientific findings so that AIHA, ACGIH, and other stakeholders may improve practice through focused outreach, promotion, and training
- Identifying research initiatives needed to advance the state of OEHS science and address gaps in practical knowledge
- Identifying opportunities to answer OEHS research questions through studies of at-risk workers
- Defining a transparent, open process across volunteer groups, local sections, and allied stakeholders concerning how the DTS-AG can create and sustain a living research agenda on behalf of the profession and how project ideas may be prioritized for future funding
- Informing the AIHA and ACGIH board and staff members of areas where internal resources should be concentrated in order to advance the state of OEHS research
- Defining AIHA’s and ACGIH’s roles as facilitators for OEHS science research, both for funded research opportunities and as “bundlers” of partners, needs, and ideas that will be brought before funding organizations
- Determining how AIHA’s volunteer representatives to National Occupational Research Agenda (NORA) councils can advocate for the national OEHS research agenda, as NORA helps inform NIOSH’s strategic plan and is an important source of funding for research and training

DTS-AG Members

- John Mulhausen, PhD, CIH, FAIHA – AIHA Member
- Paul Wambach, CIH – AIHA Member
- Cullen Charles Whittaker, CIH, CSP – AIHA Member
- Mark J. Wilson, MSPH, PhD – AIHA Member
- Donald Weekes, CIH, CSP, FAIHA – AIHA Member
- Alison Elder, PhD – ACGIH Member
- Paul Middendorf, PhD, CIH – AIHA Member
- Christy Forrester, PhD, MS – NIOSH Liaison
- Kimberly Castillon, CIH – AIHA Board Liaison
- Michele Twilley, DrPH, CIH – AIHA Staff Liaison

Process Overview

Input from AIHA and ACGIH volunteer committees and other interested parties is submitted using a web submission form. The DTS-AG reviews and assigns each research question or problem a weighted score, aggregated across predetermined criteria. Projects that receive higher scores will be given higher priority on the AIHA / ACGIH research agenda. The agenda will be communicated to a variety of audiences, including, but not limited to, NIOSH, other governmental agencies, academic institutions, and for-profit research entities. Over time, DTS-AG’s goal is to identify suitable research partners that are positioned to fund their own research. AIHA and ACGIH stand ready to assist these projects at various phases, depending on their needs. It is also possible that AIHA or ACGIH will consider underwriting particular projects, which would require formal approval by the organizations’ respective boards of directors.
Research Categories
The DTS-AG defines “ideas” generally as concepts that will advance the OEHS practice or OEHS profession as follows:

- **Ideas that advance the OEHS practice** are those that enable practitioners to conduct their work equipped with the latest methods and techniques based on sound, science-supported research. This category encompasses more traditional “pure” research topics, such as qualitative judgment accuracy and defining appropriate Bayesian priors.

- **Ideas that advance the OEHS profession** are those that promote understanding of the profession from a more holistic perspective. These ideas might improve OEHS practitioners’ appreciation of their roles in building certification programs (e.g., the LEED rating system and WELL Building Standard), product stewardship, and general management and leadership—areas in which OEHS practitioners are increasingly being held responsible. This research will be based in science but will not necessarily center on traditional industrial hygiene (IH) topics.

Scoring Rounds

To facilitate idea submission and scoring, DTS-AG divides the calendar year into multiple rounds, as follows.

For calendar year 2021–2022 (inaugural year):
- Round One: Submissions received by July 17, 2021
- Round Two: July 17, 2021–October 15, 2021

For calendar year 2022–2023:
- Round Four: January 16, 2022–April 15, 2022
- Round Five: April 16, 2022–July 15, 2022
- Round Six: July 15–October 14, 2022
- Round Seven: October 15, 2022–January 14, 2023

Prioritization
Currently, research ideas submitted through the Smartsheet portal are evaluated by the DTS-AG after each round closes. Moving forward, each new idea submitted through the portal will be assigned an AIHA or ACGIH committee or working group tasked with reviewing the proposal content, identifying gaps in the proposal, and suggesting opportunities to complete the research. Once vetted by the committee, the DTS-AG will score the ideas for placement on the research agenda.

The research ideas are scored by each member of the DTS-AG on a scale of zero to nine against five criteria:

- Day-to-day applicability to practitioners
- Improved impact on practice integrity
- Scope of impact—i.e., the number or percentage of workers positively impacted
- Impact on affected workers’ health
- Likelihood of success

Click here (PDF) for scoring details.

The scores are aggregated and validated by the DTS-AG. Priorities are assigned by the DTS-AG as A (high), B (medium), or C (low) based on the aggregate score. The higher-scoring research ideas, which are judged to have more impact or affect a broader array of practitioners or workers, are ranked as priority A. Ideas with limited scopes of impact or that focus on a subset of practitioners or workers will be ranked as priority B or C. Some research ideas prioritized as C may require additional refinement by the submitter or technical committee.
Research Agenda
The AIHA/ACGIH research agenda is an evergreen approach to advancing and disseminating information and enhancing the integrity of professional OEHS practice. The standalone AIHA/ACGIH research agenda will be developed as additional information is gathered and will be presented in a format typical of national scientific research agendas. In its nascent stage, the agenda is a presentation of research ideas submitted on the DTS portal coupled with conceptual ideas for research gleaned from two brainstorming sessions held in September 2021. Scored research ideas from the portal are available in the Smartsheet form.

September 2021 Brainstorming Sessions
As previously noted, two brainstorming sessions were held virtually through the video conferencing program Zoom. In each Zoom session, there were four rooms, each with a moderator to manage discussions associated with the following subject areas:

1. Administrative controls and engineering controls
2. Personal protective clothing and equipment
3. Health effects, standards, and guidelines
4. Exposure assessment strategies and surveillance

The sessions were recorded and transcribed. Each idea was reviewed by staff and classified as a research idea, a barrier to practice, or both. The ideas were further grouped by themes and key words. The moderated questions and conceptual research ideas from the brainstorming session are summarized in Appendix A.

Committees and working groups may designate Research and Development (R&D) officers to coordinate volunteer group efforts under the Defining the Science Initiative. In summary, each group’s R&D officer is charged with leading and facilitating, but not necessarily performing, the following tasks, which support the national research agenda:

- Reviewing and refining research project submissions
- Developing research project ideas in the web portal
- Reviewing barriers to practice and suggesting guidance documents, courses, and other resources that would help reduce these barriers
- Assisting the DTS-AG in:
  - Matching potential research projects with researchers and funding
  - Matching research projects with practitioners and workplaces
  - Matching research results with practitioners

Currently, R&D officers will receive 0.5 CM points for CIH certificate maintenance each year (equivalent to other non-Chair officer and active member positions) from the Board of Global EHS Credentialing. AIHA is in the process of requesting for the position’s allotment to be increased to one full CM point per year due to the higher level of activity anticipated for R&D officers compared to other volunteer committee and working group positions.

Intersecting OEHS Initiatives
DTS may overlap with other initiatives, such as the Content Portfolio Advisory Group, Workplace Health Without Borders, and the Grand Challenges Initiative. Refer to Appendix B for a brief overview of potentially intersecting OEHS programs and initiatives.
Appendix A: Summary of Conceptual Research Ideas from the DTS Brainstorming Sessions Held September 2021

Two four-hour-long brainstorming sessions were held virtually using the Zoom teleconferencing platform on September 21 and 23, 2021. All participants were briefed before the brainstorming sessions about the procedures that the sessions would follow. Then, the participants were divided into four rooms, comprised of representatives from AIHA and ACGIH. Rooms were assigned by areas of interest:

- **Room One:** aerosol technology, ionizing radiation, nano and advanced materials, nonionizing radiation, protective clothing and equipment, real-time detection systems, respiratory protection, and teen workplace health and safety
- **Room Two:** confined spaces, construction, hazard prevention and engineering controls, mining, noise, oil and gas, safety, biosafety and environmental microbiology, cannabis industry health and safety, environmental issues, and social concerns
- **Room Three:** biological monitoring; ergonomics; healthcare; occupational and environmental epidemiology, stewardship, and sustainability; incident preparedness and response; indoor environmental quality; opioids; and communication and training methods
- **Room Four:** computer applications, exposure and control banding, exposure assessment strategies, laboratory health and safety, museums and cultural heritage, risk, sampling and laboratory analysis, toxicology, and leadership and management

Each room was assigned a moderator to manage breakout session discussions associated with the following subject areas:

1. Administrative controls and engineering controls
2. Personal protective clothing and equipment
3. Health effects, standards, and guidelines
4. Exposure assessment strategies and surveillance

The moderators cycled through the breakout sessions at 30-minute intervals. Once the breakout sessions ended, the moderators held a closing briefing to review the findings. The sessions were recorded and transcribed, yielding a total of 16 hours of content. Each idea was reviewed by staff and classified as a research idea, a barrier to practice, or both. The ideas were further grouped by themes and key words. The moderated questions and conceptual research ideas from the brainstorming session are summarized below.

### Administrative Controls and Engineering Controls

Questions for the administrative and engineering controls brainstorming session were prepared by Cullen Whittaker, and the room was moderated by Kim Castillon. The participants of the brainstorming session were asked the following questions:

1. What is holding you back from implementing certain engineering or administrative controls that can be addressed with better information about controls so that stakeholders can learn the value of these types of controls?
2. What are some broad topics related to engineering or administrative controls that you would like to see researched (e.g., ventilation)?
3. What are some specific topics related to engineering or administrative controls that you would like to see researched (e.g., testing general dilution flow rates to see the effect on weld quality)?
A total of 68 ideas were identified as either barriers to practice or research ideas under the broad topic of administrative and engineering controls.

**ADMINISTRATIVE CONTROLS**

A total of 14 ideas were recorded for the topic of administrative controls (n=11) or for both administrative and engineering controls (n=3). The themes of these 14 ideas centered on awareness and communication, heat stress, pandemics, and risk reduction. The following ideas emerged from the brainstorming session:

**Awareness and Communication**

Develop effective communication techniques that will alleviate warning fatigue and prevent fatalities in confined spaces.

**Heat Stress**

Advance technology using sensors and wearable biomonitoring devices to protect workers from heat stress, use data collected via these technologies to assist OEHS professionals in establishing administrative and engineering controls, and overcome obstacles such as ethical and data privacy issues.

**Pandemics**

- Advance technology using sensors and wearable devices to prevent disease transmission between workers (e.g., proximity sensors) or predict early onset of illness (e.g., biomonitors), use data collected via these technologies to assist OEHS professionals in establishing administrative and engineering controls, and overcome obstacles such as ethical and data privacy issues.
- Develop models to determine maximum occupancy times in buildings in order to reduce the potential for airborne infectious disease transmission.

**ENGINEERING CONTROLS**

A total of 51 ideas were recorded for engineering controls. The themes of these 51 ideas centered on engineering control design, value strategy, ventilation, and other subjects. The following ideas emerged from the brainstorming session:

**Design**

- Determine barriers preventing OEHS professionals from participating in the early stages of building, process, and engineering control design.

**Value Strategy**

- Develop calculator tools that effectively demonstrate returns on investment for implementing engineering controls, including the development of metrics, key performance indicators, and data analytics to promote exposure control strategies.

**Ventilation**

- Apply computational fluid dynamics and generate valid models to evaluate departures from ventilation assumptions, including mixing factors, airflow patterns, and dilution ventilation.
- Research and develop bioaerosol or contaminant controls with humans as the exposure source.
- Research, develop, and validate alternative air cleaning devices, such as ultraviolet-C (UV-C) air purifiers.
- Research and develop novel, nimbler, and smaller ventilation systems.

**Risk Reduction**

- Develop tools to quantify the effectiveness of risk reduction activities and determine residual risk.
Other

- Evaluate the effectiveness of plastic barriers as engineering controls to prevent infectious disease transmission.
- Research and develop artificial intelligence (AI) technologies for use in engineering controls.
- Research and develop interior duct linings that contribute to good indoor air quality.
- Develop validated, industry-specific ventilation requirements, such as requirements specific to the animal processing industry.
- Research and develop sustainable engineering controls, such as those that have lower energy demand.
- Research how to safely retrofit old buildings with old fume hoods.

PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT

A total of 18 ideas were recorded for personal protective clothing and equipment. The themes of these 18 ideas centered on PPE selection, fit, technology, and other subjects. The following ideas emerged from the brainstorming session:

Selection

- Research and develop combined PPE that addresses multiple hazards together, such as laboratory chemicals, arc flashes, and high heat.
- Develop uniform and consistent PPE selection advice based on hazard and task intensity.

Fit

- Research PPE ensembles that can be integrated (e.g., combinations of respirators, safety glasses, and hearing aids that fit together) to improve wearer comfort, reduce interference between ensemble pieces, and reduce risk of failure.
• Research and develop PPE that incorporates comfort factors, such as proper sizing and fit, for a broad range of users and applications, including for use by various genders, workforces, ages, and pregnancy statuses.

Technology
• Research and develop novel PPE-integrating technology, including new materials and designs, sensors, and dashboards.
• Develop apps to promote PPE selection and use as well as addressing PPE limitations.
• Update and develop new assigned protection factors for PPE.

Other
• Research and develop sustainable and biodegradable materials for use as PPE.
• Research the effective stockpiling and use of strategic reserves of PPE.
• Create assessment tools for evaluating body burden while wearing PPE.

RESPIRATORY PROTECTIVE EQUIPMENT
A total of 24 ideas were recorded for respiratory protective equipment (RPE). The themes of these 24 ideas centered on selection, use, fit, innovation, and face masks. The following ideas emerged from the brainstorming session:

Selection
• Develop uniform selection guidance for all forms of RPE, including face masks under a variety of exposure conditions and during pandemics.
• Study the efficacy of respiratory protection developed under the voluntary standard ASTM F3407-21, Standard Test Method for Respirator Fit Capability for Negative-Pressure Half-Facepiece Particulate Respirators.

Use
• Research effective cleaning and disinfecting of helmets, powered air purifying respirators (PAPRs), and N95 respirators.
• Research methods of determining and verifying protection provided by RPE during use.

Fit
• Explore options for respirators that work for users with facial hair.
• Research assigned protection factors and fit.

Innovation
• Research and develop respirators that are comfortable to wear for extended periods of time.
• Research and develop respiratory protection that uses sensors to evaluate performance, fit, filter life, breathing rate, and other factors.
• Research the design of future respiratory protection, such as through exploring construction materials, adhesive and magnetic fit, and the addition of cartridges to adhesive fit respirators.
• Research low-cost PAPR models that run on conventional batteries.
• Research sustainable and reusable respirators, along with the adoption of modern, lightweight PAPRs and washable or reusable filter cartridges.

Face Masks
• Study differences in bioaerosol exposure reduction obtained through the use of surgical masks and N95 respirators in dental clinics.
• Conduct a meta-analysis of available literature to compare the effectiveness of surgical, cloth, and N95 face masks.
• Research the effectiveness of face masks in providing protection to people in addition to the wearer.

GLOVES
A total of seven ideas were recorded for gloves. The following ideas emerged from the brainstorming session:

• Research and develop gloves with incompatibility or breakthrough indicators.
• Increase testing of glove materials against the many chemicals and chemical mixtures that lack selection guides.
• Research and develop new glove materials and test and certify these materials.
• Standardize glove material performance information across vendors.

OTHER
Three more ideas were addressed under the PPE category: these concerned eye, head, and hearing protection. The following ideas emerged from the brainstorming session:

• Conduct research on the hazards of blue light and develop proper controls and eye protection.
• Research and develop modernized head protection and improved protection against head injuries and trauma.
• Research the use of noise cancelling devices in hearing protection.

Health Effects, Standards, and Guidelines
Questions for the health effects, standards, and guidelines brainstorming session were prepared by Paul Wambach, who was also the room moderator. The participants of the brainstorming session were asked the following questions:

HEALTH EFFECTS
Hypotheses-forming research:
1. How can OEHS professionals observe and investigate unusual cases or patterns of injury, illness, or exposure?
2. How can OEHS professionals conduct surveillance—the systematic collection and analysis of health-related data—needed for the planning and evaluation of health protection practices?

Hypotheses-proving research:
1. Toxicology. What laboratory animal or bioassay models can be used to establish mechanisms and dose responses for toxic effects?
2. Epidemiology. How can OEHS professionals study the distribution patterns and determinants of health and disease conditions in defined populations?

STANDARDS AND GUIDELINES
Defining work conditions that provide desired levels of protection:
1. What research on health effects is necessary to establish safe exposure levels, where no adverse effects are observed?
2. How can OEHS professionals apply uncertainty factors to address the limitations in the available data?
3. What specific controls are needed to eliminate or reduce sources of exposure?

Exposure monitoring and control methods:
1. How should the results of measurements and observations be interpreted to guide decisions on the necessity of controls?
A total of 33 ideas were identified as either barriers to practice or research ideas under the broad topic of health effects, standards, and guidelines.

**HEALTH EFFECTS**
A total of 27 ideas were recorded for the topic of health effects. The themes of these 27 ideas centered on biological hazards, epidemiology, and toxicology. Themes of medical monitoring and emerging industries were also discussed. The following ideas emerged from the brainstorming session:

**Biological Hazards**
- Research how to translate science to practice and public policy.
- Research and develop risk assessment techniques for bioaerosols, such as occupational exposure limits (OELs) or permissible exposure limits (PELs), and control options such as control banding, that address personal susceptibility and humans as exposure sources.
- Develop a framework for managing infectious agents in a coordinated effort to use a common language with infection control specialists.

**Epidemiology and Toxicology**
- Research and develop OELs for more chemicals.
- Study the effects of recreational cannabis use on injury rates in the construction industry.
- Study the causes of suicide among construction industry workers.
- Study the relationship between mental health and occupational exposures to dust and other toxins.
- Study the potential synergistic effects of pharmacology and medications with workplace exposures that influence decisions about controls.
- Study the relationship between mixtures of hazards or multiple hazards and health effects.
- Develop and interpret computational toxicology studies that can inform OEL development.

**Medical Monitoring**
- Develop metrics for identifying stressors in the workplace that affect mental health.
- Research tracking for exposures, biomarkers, and health effects.
- Develop methodologies and systems to track cumulative doses over workers’ lifetimes.

**Emerging Industries**
- Study hazards associated with 3D printing using novel materials.
- Study injuries and illnesses associated with teleworking.

**STANDARDS AND GUIDELINES**
A total of six ideas were recorded for the topic of standards and guidelines. The themes of these ideas centered on exposure monitoring. The following research ideas emerged from the brainstorming session:

**Exposure Monitoring**
- Develop and adopt standards for exposure sampling frequency, sampling methods, and sampling efficiency.
- Develop standards for assessing complex mixtures.

**Other**
- Develop standards and guidelines for confined space entry.
- Develop standards that align with ISO standards on respiratory protection.
Exposure Assessment Methods

Questions for the exposure assessment methods brainstorming session were prepared by Don Weekes, who was also the room moderator. The participants were asked the following questions:

1. How can the two primary workplace exposure assessment methods (point of contact and biological monitoring) be integrated effectively to prevent occupational diseases?
2. What research is needed to determine the feasibility of this integration?
3. What entities, including governmental labs, academic labs, and research facilities, should be performing this type of research?
4. How does AIHA support this research?

A total of 28 ideas were identified as either barriers to practice or research ideas under the broad topic of exposure assessment methods.

The themes of these 28 ideas centered on biomarkers and biomonitoring. Other ideas covered air monitoring, dose monitoring, exposure data integrity, surface sampling, tools, novel industries, and the value of the profession. The following ideas emerged from the brainstorming session:

**BIOMARKERS AND BIOMONITORING**

- Research complying with the Health Insurance Portability and Accountability Act (HIPPA) and Canadian privacy regulations when protecting worker health and understanding the legal construct, the role of OEHS professionals, and medical information sharing.
- Research how OEHS professionals can better serve workers at their current health statuses (e.g., workers with diabetes or hypertension).
- Model the relationship between exposure monitoring, biological monitoring, and clinically relevant outcomes.
- Develop standards and guidelines for biological exposure monitoring.
- Research the dose-response relationship between cannabinoids and impairment.
- Develop tools to evaluate non-occupational exposures and interpret biomonitoring results (e.g., the correlation between blood lead levels and various hobby activities).
- Research approaches that use biological monitoring to evaluate systemic effects when air monitoring is not effective at identifying health hazards.
- Research and develop self-administered tests for exposures (e.g., home nasal swab tests for COVID-19).
- Research and develop mobile applications (apps) that aid in biological monitoring.

**OTHER**

Research and develop solutions that shift OEHS professionals’ dependence from exposure monitoring to dose monitoring techniques, with the goal of determining workers’ cumulative lifetime doses

- Develop methods for interpreting surface wipe sample results.
- Develop models to correlate personal exposure monitoring with ambient or environmental monitoring.
- Develop models to correlate co-exposures between noise and ototoxic chemicals.
- Research exposure monitoring needs for smoothie shops, cannabis industry stakeholders, and wildfire responders.
- Research and develop tools that can be used for exposure monitoring.
Exposure Assessment Strategies and Surveillance

Questions for the exposure assessment strategies and surveillance brainstorming session were prepared by John Mulhausen, who was also the room moderator. The participants of the brainstorming session were asked the following questions:

**EXPOSURE ASSESSMENT STRATEGIES**

**General**
1. Where are the weak points in OEHS professionals’ exposure assessment processes?
2. What issues or frustrations do you face in your work?
3. What keeps OEHS practitioners and the OEHS profession from being effective and efficient at characterizing exposure risks?
4. Are you confident that the strategies you are using ensure all exposures are being assessed and managed for all people under your care? What could be improved?
5. How do we measure the success of exposure assessments?
6. What research can be undertaken to improve the methodology of exposure assessment?

**Statistical Tools**
1. Are you familiar with tools for the statistical analysis of IH data?
2. What issues or concerns do you have about use of these tools?
3. Are you familiar with Bayesian tools for the statistical analysis of IH data?
4. What issues or concerns do you have about use of the Bayesian statistical tools?

**SURVEILLANCE**

**General**
1. What issues or frustrations do you face regarding the collection and use of surveillance data, whether exposure, medical, or health data?
2. What keeps OEHS practitioners and the OEHS profession from being effective and efficient at surveillance?

**Exposure**
1. What issues or concerns do you have related to exposure surveillance, beyond those voiced during the discussion of exposure assessment strategies?
2. What issues need to be addressed to facilitate cross-organization exposure surveillance?

**Medical**
1. What issues or concerns do you have regarding medical surveillance?
2. What issues need to be addressed to facilitate cross-organization medical surveillance?

**Health**
1. What issues or concerns do you have related to health surveillance, beyond those voiced during the medical surveillance discussion?
2. What issues need to be addressed to facilitate cross-organization health surveillance?

A total of 82 ideas were identified as barriers to practice or research ideas under the broad topic of exposure assessment strategies and surveillance.
EXPOSURE ASSESSMENT STRATEGIES

A total of 75 ideas were recorded for the topic of exposure assessment strategies. The themes of these 75 ideas centered on data collection and interpretation and hazard and risk assessment, while the theme of emerging industries was also discussed. The following ideas emerged from this brainstorming session:

Data Collection and Interpretation

- Develop secure and anonymous collection platforms for sensor data.
- Develop aggregate exposure data for industries and controls.
- Research and develop sampling and analysis for aerosolized infectious agents.
- Research and develop simplified statistical tools for Big Data sets.
- Develop processes for self-monitoring exposures.

Hazard and Risk Assessment

- Research the effects on health caused by short-term peak exposures.
- Research the influences of mixtures of exposures.
- Research and develop real-time detection instruments to characterize individual chemical compounds of complex mixtures.
- Research worker health and safety effects associated with recreational cannabis use.
- Research and develop cumulative risk assessment models for worker health.
- Develop models linking exposures to health effects.
- Research and develop tools to evaluate residual risk.
- Conduct epidemiological studies of worker health outcomes using aggregated exposure data.

Emerging Industries

- Research and develop guidelines to address hazards faced by cannabis industry workers, including guidance for baseline physical examinations prior to the assignment of PPE.
- Research and develop hazard assessment strategies for smoothie shops, home healthcare workers, and assisted living facilities, as well as people experiencing non-occupational exposures to wildfires.

Other

- Develop methods to assess and track previous workplace exposures.
- Develop methods of using biomonitoring as a screening tool for investigating exposures.
- Research the application of public health principals to occupational safety and health, with emphasis on bioaerosol modeling.
- Research and develop exposure assessment guidelines for heat stress that cover monitoring equipment, wearable technology, equipment certification, legal issues, and workplace variability.
- Validate exposure assessment strategies and approaches for decision-making and controlling workplace hazards.

SURVEILLANCE

A total of seven ideas were recorded for the topic of surveillance. The following ideas emerged from this brainstorming session:

- Research and develop a surveillance system that can predict and prevent adverse health outcomes.
Value of the Profession and Value Strategy

During the brainstorming sessions held on September 21 and 23, participants discussed research ideas and barriers to practice related to the application of the hierarchy of controls, exposure assessment strategies, health effects, surveillance, and standards and guidelines. From the discussions emerged a need for OEHS professionals to address value strategy, both in terms of the profession’s value and in terms of developing a business case for instituting programs and controls. In addition to discussing the broad topics previously listed, the brainstorming session participants also identified a total of 19 ideas associated with the value of the profession and value strategy.

The following ideas emerged from the discussion on value:

- Research how to better communicate and drive science-based awareness to policy makers.
- Research and develop a return on investment calculator tool to help make business cases for controls.
- Develop metrics or key performance indicators for OEHS professionals.
- Revisit the Business Case/Value Strategy project within AIHA to update the business terminology and methods.

Appendix B: Similar OEHS Programs and Initiatives

DTS may intersect with other programs and initiatives led by AIHA and ACGIH members. These include:

The Content Portfolio Advisory Group (CPAG)

AIHA’s mission includes providing cutting-edge education and training resources that help members protect and improve the OEHS profession. Creating content with AIHA provides great opportunities for OEHS professionals and students to publish creative intellectual work, nurture the skills they need for success, and cultivate their professional development. This process is overseen by CPAG, which prioritizes ideas that support one or more of five content priorities:

- Big data and sensor technologies
- Communicating OEHS concepts
- Exposure banding
- Serving the changing workforce
- Total Exposure Health

New educational products may be proposed by AIHA committees and working groups based on ongoing review of “barriers to practice” ideas. These proposals will be routed through the CPAG approvals process.

To learn more, visit AIHA’s publications and content channels webpage.

The Grand Challenges Initiative

In 2020, the AIHA Board of Directors approved a Grand Challenges special project that will work towards the following goals:

- Defining critical Grand Challenges that improve worker health, safety, and well-being across disciplines, sectors, and geographic boundaries.
- Increasing public recognition of the value of the OEHS profession.
- Engaging allied professions, business leaders, workers’ organizations, international OEHS leaders, and others to garner ideas for Grand Challenges.
This initiative is in its initial stages, and further developments are planned for 2022.

**The WHWB Global Challenges Initiative**

Occupational health has historically been a low priority for global public health initiatives and international health organizations. However, the COVID-19 pandemic has shone new light on the importance of workplace exposures to hazards such as infectious diseases. Now is an opportune moment to raise the profile of occupational health.

In 2021, Workplace Health Without Borders (WHWB) convened a discussion on advancing primary prevention and occupational health within the global public health agenda. Participants included representatives from ACGIH, the International Commission on Occupational Health (ICOH), the Occupational Hygiene Training Association (OHTA), the Canadian Centre for Occupational Health and Safety (CCOHS), the Institute for Work and Health (IWH), the African Union, OSHAfrica, the National Institute of Occupational and Environmental Health of Vietnam, the International Occupational Hygiene Association’s Developing World Outreach Initiative, and WHWB and its branches. Their discussion covered three key questions:

- How can we elevate occupational health on the global health agenda?
- Are there two or three specific issues which we should focus on?
- Can or should OEHS organizations collaborate on raising the profile of OEHS?

This effort is in the very early stages of development.

**NIOSH’s Future of Work Initiative**

NIOSH describes its Future of Work Initiative as “a collective effort of transdisciplinary research and communication throughout NIOSH, other government agencies, and organizations.” The agency launched the initiative, which will follow Total Worker Health principles, in response to changes in work, the workplace, and the workforce. To address the future of work in the U.S., NIOSH’s initiative will find new research solutions, practical approaches, and partnership opportunities. This initiative has four primary goals:

- Compile studies on the future of work.
- Feature current and relevant research projects.
- Promote research among new industries, technologies, organizational design, job arrangements, risk profiles, and ways to control risk.
- Connect trends in workplace, work, and workforce changes to prepare for the future of occupational safety and health.

More information can be found on NIOSH’s Future of Work webpage.

**AIHA’s Standards of Care**

This initiative will document, in a concise, easy-to-use summary, the minimum recommended global standards of care for professional OEHS practice that incorporate best risk management practices whenever feasible. Standards of care are defined as minimum expected standards of practice and performance established for a particular profession or function. They differ from competencies, which pertain to what professionals know (e.g., CIH rubrics), to focus on the performance of professionals’ work. For example, you may conceive of a standard of care that recommends control strategies going beyond regulatory requirements to meet an OSHA PEL. Instead, the standard of care aims higher, to increase worker risk protection by using the lower of two values proposed by either a PEL or an ACGIH Threshold Limit Value (TLV).

A Standards of Care Advisory Group has been formed.
AIHA and ACGIH's Improving Exposure Judgments

This initiative will shift the OEHS practice from one in which tools and activities that improve exposure judgment accuracy are rarely or sporadically used to one in which their use is routine and expected. This will translate into greater use of AIHA’s suite of tools for improving exposure decisions, such as the Checklist Tool and IHMOD2.0 for qualitative judgments, and statistical tools, such as IHSTAT or the Bayesian decision analysis tool IHDA-AIHA, for accurately interpreting monitoring data.

An Improving Exposure Judgments Advisory Group has been formed. For more information about AIHA's etools, visit the association’s online Apps and eTools Resource Center.

AIHA’s State of the Art vs. Practice

This initiative, which is reflected in AIHA’s 2022–2024 strategic plan under the integrity of professional practice domain, will define and implement a continuous improvement strategy that will identify and address gaps between current and state-of-the-art OEHS practice. It builds upon the Standards of Care Initiative to understand barriers preventing state-of-the-art or minimum standards of care practices, in order to put in place plans to address those barriers and empower practitioners to achieve best-in-class performance. The Noise Committee has already stepped up to serve as a beta test group for this effort.