

Chemical Safety as a Core ACS Value: Report on the 2018 Safety Summit

Introduction

In December 2016, the ACS Board of Directors adopted *safety* as one of the Society's core values, thus affirming that the Society and its members are expected to be leaders in this area. This commitment, which requires a thoughtful and educated approach, recognized that safety is the responsibility of everyone involved in the chemistry enterprise. The practice of chemistry from concept through research, development, manufacture, use, and disposal must include best safety practices in order to minimize individual and public risks while optimizing the societal benefits of the resulting technology.

Recognizing that the Society needs to translate its core value of safety into action, ACS President Peter Dorhout sponsored the first ACS Safety Summit at ACS Headquarters on February 2-4, 2018. He called upon leaders from ACS governance and technical units to help organize the event. External stakeholders representing organizations with expertise and interest in this topic were also identified and invited to participate. Discussion at the Summit centered around four key goals identified by Dr. Dorhout:

1. Identify, connect, and coordinate current ACS efforts and expertise in the area of chemical safety, particularly as it applies to safety culture in academic laboratories.
2. Formulate future ACS strategy to demonstrate the Society's leadership in advancing a culture of safety in the chemical enterprise.
3. Engage ACS stakeholders and external experts in the chemical safety conversation to promote an ethos of safety.
4. Identify tools, opportunities, and partnerships that ACS can leverage to support safety cultures.

Summit participants represented the entire span of the chemical enterprise, including small businesses, national laboratories, government, academia, industry, and non-profit organizations. Representatives from the following ACS groups and partner organizations participated in the Summit:

ACS Groups

- *Chemical & Engineering News*
- Committee on Chemical Safety
- Committee on Professional Training
- Committee on Public Relations & Communications
- Corporation Associates
- Divisional Affairs Committee

- Division of Chemical Education
- Division of Chemical Health & Safety
- Division of Chemical Information
- Graduate Education Advisory Board
- Safety Advisory Panel

Partner Organizations

- American Industrial Hygiene Association
- Association of Public and Land-grant Universities
- Chemical Safety Board
- Dow Chemical Company
- Eastman Chemical Company
- National Institutes of Health
- National Science Foundation
- Oak Ridge National Laboratory
- Pistoia Alliance
- Princeton University
- Texas Tech University
- University of California's Center for Laboratory Safety
- Yale University

Opening Discussions

The Summit started with presentations that provided a broad overview of chemical safety in the context of ACS's past efforts, and a review of key data and research related to safety systems and cultures. The four goals of the ACS strategic plan were presented through the lens of chemical safety:

1. **Provide information solutions:** Connect safety information resources into a flexibly structured ecosystem of ACS and external resources, led by a partnership of ACS and external stakeholders.
2. **Empower members and member communities:** Empower members to become safety leaders as part of their professional and ethical skill set, which are core personal assets.
3. **Support excellence in education:** Develop RAMP-based safety education resources with a focus on building risk assessment skills.
4. **Communicate chemistry's value:** Model safety culture (risk assessment, leadership and empowerment) to the four ACS key audiences.

The National Academies' report *Safe Science: Promoting a Culture of Safety in Academic Chemical Research* provided a foundation for discussions on the challenges encountered when trying to instill a culture of safety across an organization. Interviews engaging approximately 40 individuals in various professional roles conducted by ACS' Web Strategy and Operations group

provided additional perspectives on chemical safety. The connection between safety and green chemistry was also noted.

The group shared the experiences of their organizations relative to chemical safety, particularly in the laboratory setting, in order to uncover existing activities and interests in the topic. Participants highlighted current activities, target audiences, existing collaborations, and challenges faced in implementing safety cultures. The conversation addressed how best to align current activities with the goals of the 2018 ACS Strategic Plan, generating ideas for new strategies and identifying opportunities and potential barriers in doing this work. Equipped with this information, participants began identifying actionable strategies and partnerships that ACS can initiate to enhance integration of safety across the chemistry enterprise.

From these broad discussions, a variety of opportunities emerged. These include:

- ACS is leading many efforts and could become a transformative force in integrating safety in all laboratory disciplines, as well as supporting chemical safety information, education, and communication that helps build a robust safety culture.
- ACS volunteers have already created momentum around change and ACS has a significant opportunity to build upon these important past efforts and establish itself as the leader in chemical safety.
- Although many organizations recognize the ACS as a key leader in the laboratory safety world, environmental health and safety professionals do not necessarily consider the ACS their professional home. ACS's focus on chemical safety does address a wide variety of hazards involved in modern laboratory research, which can include biological, radiation, mechanical and novel emerging hazards.
- Within the ACS, safety efforts are currently concentrated within a few specialized groups (primarily the Division of Chemical Health and Safety and the Committee on Chemical Safety), but safety should be integrated in all ACS programs and divisions.
- ACS messages related to safety are often in response to negative situations, such as reports about accidents, which indicate a lack of safety. By connecting effective safety practices and cultures to scientific success, the ACS can communicate the powerful message that good science is safe science.

Identification of Action Steps

During the second day of the Summit, the group narrowed its discussion to assess a variety of actionable strategies organized around the four ACS strategic goals.

Goal 1: Provide Information Solutions

Safety Strategy: Information/Research Support: ACS should leverage its current resources to become the authoritative laboratory chemical safety information source.

The ACS prides itself on being the preeminent source of chemical information and boasts the oldest and most comprehensive chemical information abstracting service. Like other chemical

information, chemical safety information is widely dispersed and can be difficult to find or access. Under the provisions of the OSHA Hazard Communication Standard, employers are responsible for informing employees of the hazards and the identities of workplace chemicals. ACS should create partner networks to connect these diverse sources into a range of useful, searchable and authoritative information sources. For example, some ACS members are primarily interested in raw data for experimental planning purposes, while others are primarily interested in best practices associated with managing safety in teaching labs. Chemists in both academia and industry are generating safety content, and ACS can collate and curate this information into a comprehensive, authoritative resource.

The following specific strategies were identified:

- Identify gaps in chemical information
- Connect, organize, disseminate and make available a variety of chemical safety information types (host, index, etc.) in an easily searchable way.
- Develop a platform that makes lessons learned, near misses, incident reports, and case studies readily available to the chemistry community.
- Collect safety moments, which can be peer-reviewed and indexed, from the communities around the ACS to help reinforce a culture of safety.
- Create a searchable collection of safety moments for use in technical gatherings.
- Provide free copies of the *Journal of Chemical Health and Safety* to all chemistry departments.
- Establish a clearinghouse of laboratory chemical safety experts, who could respond to safety questions or recommend consultants for more complex questions, as an ACS service to the community.

The suggested partners to work with in advancing this goal include: the Division of Chemical Health and Safety, Committee on Chemical Safety, *C&EN* staff, Chemical Abstracts Service, ACS Publications, ACS Division of Chemical Information, ACS Education Division, ACS Web Strategy and Operations, the Pistoia Alliance, the University of California Center for Laboratory Safety (UCCLS), Campus Safety Health and Environmental Management Association (CSHEMA), American Industrial Hygiene Association, Stanford University, and the National Library of Medicine.

Goal 2: Empower Members and Member Communities

Safety Strategy: Partnerships/Communities. ACS should create strategic partnerships and communities across disciplines to empower chemistry practitioners through development of chemical safety skills.

The distinction between creating partnerships and communities around chemical laboratory safety and laboratory chemical safety was articulated. This distinction suggested that ACS might consider becoming a Center for Laboratory Chemical Safety and reach out to engineers, biologists, medical scientists, etc. about the safe use of chemicals in laboratory settings. This

approach was strongly supported by the NIH representative who suggested that much of the research conducted at the NIH would not qualify as chemistry research, but because researchers work with a variety of chemicals, they must have access to chemical safety information and best practices.

The following specific strategies were recommended:

- Identify strategic partners to support goals for an ACS Center for Laboratory Chemical Safety and formalize them through Memoranda of Understanding.
- Convene a Safety Summit for these partners to discuss the possible synergies and areas for collaborations.
- Lead an effort for Federal funding agencies to require safety information on all research proposals.
- Create online platforms and workshops for sharing best practices and enabling continuous dialogue about safety. (see bullet 2 under Goal #1)
- Regularly bring together members from different parts of the ACS (students, faculty, environmental health and safety experts, and industrial members) to create chemical safety learning communities.

The suggested partners for advancing this goal include the Division of Chemical Health and Safety, Committee on Chemical Safety, University of California Center for Laboratory Safety (UCCLS), Campus Safety Health and Environmental Management Association (CSHEMA), Chemical Safety Board, National Science Foundation, Oak Ridge National Laboratory, National Institutes of Health, Yale University, Princeton University, Texas Tech University, Association of Public and Land-grant Universities, American Institute of Chemical Engineers Center for Chemical Process Safety, the Dow Chemical Company, and other universities with strong safety cultures.

Goal 3. Support Excellence in Education

Safety Strategy: Education/Empowerment. ACS should support excellence in safety education by creating and disseminating safety content that would enable integrating safety knowledge throughout the entire chemistry curriculum.

Laboratory safety involves the development of specialized knowledge, skills and responsibility and must be an integral part of the chemistry curriculum. This means that safety education and awareness must be integrated into each laboratory course as well as into academic research laboratories, with increasingly broader scope at more advanced levels.

The following specific strategies were identified:

- Integrate safety into existing ACS education programs, such as workshops for new faculty, public outreach activities, Student Chapters, and High School Chemistry Clubs.

- Develop safety specific content that could be integrated into the classroom curricula and connected to the Next Generation Science Standards.
(<http://www.nextgenscience.org>)
- Develop a variety of resources using active learning strategies and technology (workshops, multimedia, online learning, flipped classrooms, etc.)
- Develop safety exams and other skill assessment strategies.
- Establish an effective ACS awards program recognizing the best safety practices in ACS programs and educational activities.
- Develop and curate safety information appropriate to teaching laboratories, research activities, and managing laboratory groups and departments. (see bullets 2-5, Goal #1)
- Create partnerships that enable transfer of industrial safety practices to academia so students graduate with a safety mindset and safety skills, making them ready for industrial employment.

The suggested partners to advance this goal include CCS Safety Education Subcommittee, Society Committee on Education, Committee on Professional Training, Corporation Associates, ACS Education Division, ACS Division of Chemical Education, American Association of Chemistry Teachers, National Science Teachers Association, and the Dow Chemical Company.

Goal 4: Communicate Chemistry's Value

Safety Strategy: Communication. Develop and execute a progressive safety communication strategy and associated plan that establishes ACS as the authority for laboratory chemical safety.

These specific short-, mid- and long-term strategies have been identified:

- Define how safety as a core value connects to professionalism and ethics and establish a public platform for explaining these principles to a variety of audiences.
- Develop a communication plan that defines messaging applicable to targeted audiences, along with methods for measuring effectiveness. For example, this could be done through an ACS-wide contest to increase visibility and maximize engagement.
- Develop messaging to make safety visible throughout the Society. Elements of these messages may include:
 - Create a brand and tagline.
 - Develop a template with safety moments and promote its use during all programs at the ACS national and regional meetings.
 - Equip the ACS Mole mascot with a safety message (beyond goggles and lab coat) that can be shared at national and regional meetings and other public events.
 - Promote existing ACS safety resources through the ACS Safety Website and a variety of other activities.
 - Develop talking points that enable Society leaders to advocate "safety as a core value".

- Develop safety leadership training to be included as part of ACS's Leadership Development Program.

The Committee on Chemical Safety has a Communication Safety Subcommittee, which can contribute its leadership and expertise to these strategies.

In summary, the Summit provided a valuable opportunity for stakeholders, both internal and external to ACS, to share information, resources, and initiatives in order to identify opportunities to enhance safety across the chemistry enterprise. Moving these ideas forward will involve new partnerships within ACS and with external partners. As they are implemented, the ideas generated during the Summit will help guide the Society's future strategy on chemical safety and further ACS's vision of "*Chemistry for Life*".