Report of Activities of the Government Relations Committee:

Submitted by Ellen Sweet

The committee has been active throughout 2015, addressing the issues listed below. In the course of this work, questions about how the Divisional Government Relations work relates to that of the ACS Office of Public Affairs (OPA) and the Committee on Chemical Safety. Discussions about the relative roles of these groups are continuing. Details of these activities and discussions are given below.

1. OSHA Request for Information, Docket No. OSHA-2012-0023
2. CSB June 10 public meeting comments
    - June 22 public meeting comments
3. OSHA 1910 regulation outline (internal ACS document)
4. Work with CCS Safety Advisory Panel

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1) **Comments were submitted on behalf of ACS DCHAS to Regulations.gov, on April 6, 2015, for RFI #OSHA-2012-0023. The comment period for this RFI has been extended so that the opportunity to comment is lasting a year.**

2) Members of DCHAS and the Office of Public Affairs began preparation of a letter to be sent to the Chemical Safety Board prior to their initial public meeting on June 10, 2015. In the process, we realized that there were many references to ACS policies in the letter. This prompted discussion about this division's role in ACS policy making and the overlap in DCHAS government relations work with the Safety Advisory Panel of Committee on Chemical Safety.

    As an alternative, the following comments were made in the chat box during the June 10th meeting:

    3) "The American Chemical Society, Division of Chemical Health and Safety, awarded the CSB with the Howard Fawcett in 2008. This was to recognize the CSB for its highly technical investigations that produce useful information that is helpful to the chemical health and safety community. We hope that the CSB will continue this work as it goes through this process." – noting in the beginning statements on the changes in policies and procedures the CSB will be going through

    4) "The American Chemical Society will be providing to the CSB a recent publication, "Identifying and Evaluating Hazards in Research Laboratories", that was a recommendation of the CSB during the Texas Tech investigation. This should serve to close the action item for the ACS." – This has since been sent to the CSB by the ACS Office of Public Affairs.

    In addition, a follow-up letter to CSB was drafted by the ACS Office of Public Affairs with regard to the ACS document *Identifying and Evaluating Hazards in Research Laboratories:*

July 30, 2015
Re: Chemical Safety Board Public Meeting, on July 22, 2015, at CSB, 2175 K St., NW, Washington, DC

On behalf of the ACS, Keri Moss Stearns of the Office of Public Affairs attended the Chemical Safety Board (CSB) Public Meeting on July 22, 2015 to offer a public comment. CSB staff has recommended a status change for the ACS published report *Identifying and Evaluating Hazards in Research Laboratories: Guidelines developed by the Hazards Identification and Evaluation Task Force*. The recommendation is to close the request with the status "Exceeds Recommended Action." CSB Recommendations Specialist Veronica Tinney read the Board's Analysis and Decision, which highlighted the thoroughness of the ACS publication as well as its distribution via the ACS website.

During the public comment period, Keri Moss Stearns spoke on behalf of ACS and thanked the CSB staff for recognizing the ACS effort in the Laboratory Safety report. She stated that the members of the ACS chemical safety community appreciated the opportunity to collaborate with the CSB and are available and eager to assist the CSB in future projects. In closing, she shared the ACS hope that the CSB, throughout its time of transition, will maintain the same admirable level of technical standards in its reports.

Both the news of the proposed status change and the ACS comments were well-received by the two Board members, Rick Engler (presiding) and Manny Ehrlich. They will vote on the recommended status change in the near future.

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3) Members of DCHAS and the OPA are preparing an internal document outlining OSHA 1910 regulations for the ACS staff. The purpose of this is provide a quick reference for those in positions of communicating ACS policies to the public that may include chemical safety aspects.
This document is limited to the OASH regulations that pertain to chemical safety. Below is the introductory statement:

"The U.S. Occupational Safety and Health Administration (OSHA) issues a number of regulations which directly impact an employer's management of chemicals. Many ACS policy statements contain references to "safety" or "chemical safety". This internal ACS document will provide a brief explanation of each chemical-related OSHA regulation. As appropriate, policy issues pertaining to a specific regulation will be addressed."

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5) DCHAS role in identifying regulations appropriate for comment has been brought to the attention of the office of Public Affairs and the Safety Advisory Panel of the CCS. This role may need to be written into the DCHAS by-laws in more detail.

Issues to be addressed:

- As a technical division our committee can make comments to Requests for Information that are around technical aspects but not ACS policy. CCS has the "freedom" to speak on behalf of ACS where ACS policy is concerned.

- Past CCS government relations work has been under the aegis of the ACS policy statement on hazardous waste generated from labs. The need to write a more general Safety Policy to include all regulatory activity with respect to chemical health and safety that the Society may be interested in influencing has been identified. The Division's role in this would set the stage for other collaborative efforts between DCHAS, SAP and OPA.
- Another policy statement that is under consideration is one that addresses similar interests and overlap in regulatory direction between the laboratory chemical health and safety and biosafety communities. This would go before the ACS board of directors for approval. The necessity of this position statement comes at a time because specific laboratories in both sectors are being examined for well-publicized incidents that have occurred at government labs.
- When there is an RFI DCHAS identifies as an opportunity to comment on, generally RFI's are open for a month or 2, a member of the SAP should be part of the writing and communicate back to the other members of the SAP. This would allow for comments to be made that include references to ACS policy. But, would also avoid overlap in efforts.

OSHA Docket Office
Docket No. OSHA-2012-0023
U.S. Department of Labor, Room N-2625
200 Constitution Avenue NW
Washington, DC 20210

Submitted electronically at: www.regulations.gov

The Division of Chemical Health and Safety of the American Chemical Society (herein referred to as DCHAS) is responding to OSHA's Request for Information (RFI) published in the Federal Register, Vol. 79, No. 197 on Friday, October 10, 2014.

The American Chemical Society (ACS) is the world's largest scientific organization composed of over 158,000 chemists, chemical engineers and allied scientists. DCHAS is the technical division of the ACS devoted to all aspects of chemical safety, chemical handling and chemical management, and is taking the lead in preparing this response. Other components of the Society have provided review of this comment, including the Committee on Chemical Safety (CCS), which authors technical guidance related to this issue, and the ACS Office of Public Affairs, which provides staff support to addressing the issues raised by the RFI. Members of the Division and the Committee are recognized as global leaders in chemical safety.

By way of background, we have attached the ACS policy position on *Chemical Risk Assessment and Regulatory Decision Making*. This document succinctly states our principles and recommendations for chemical risk assessment, particularly with regard to government regulation of chemical commerce.

Because DCHAS and CCS's expertise is well recognized in laboratory situations as defined by the OSHA laboratory standard, we will focus our comments on how OSHA's questions apply in the laboratory setting. The stated purpose of the OSHA RFI is:

> *to present background information and request comment on a number of technical issues related to aspects of OSHA's rulemaking process for chemical hazards in the workplace.*
>
> - *Review OSHA's current approach to chemical regulation in its historical context;*
> - *Describe and explore other possible approaches that may be relevant to future strategies to reduce and control exposure to chemicals in the workplace;*
> - *Inform the public and obtain public input on the best approaches for the Agency to advance the development and implementation of approaches to reduce or eliminate harmful chemical exposures in the 21st century workplace*.

DCHAS provides the following responses to these elements of OSHA's RFI, using the questions OSHA poses as starting points.

> ***Question IV.A.2****: If there is no OSHA PEL for a particular substance used in your facility, does your company/firm develop and/or use*

internal occupational exposure limits (OELs)? If so, what is the basis and process for establishing the OEL? Do you use an authoritative source, or do you conduct a risk assessment? If so, what sources and risk assessment approaches are applied? What criteria do facilities/firms consider when deciding which authoritative source to use? For example, is rigorous scientific peer review of the OEL an important factor? Is transparency of how the OEL was developed important?

Many research laboratories in academic and industrial settings confront a lack of safety guidance, not only with regard to OSHA PEL's, but with regard to other safety data for novel chemicals. To help address this challenge, the ACS Committee on Chemical Safety (CCS) has published a risk assessment guidance document for research laboratories (hereinafter CCS Publication)[1]. The key concept in the CCS Publication is that of a *scalable risk assessment*, in which the level of detail required for the risk assessment is based on the hazards associated with the laboratory operations being conducted. In laboratories, these hazards extend beyond chemical concerns to address biological, radiation and equipment hazards, which must be considered as part of the overall risk assessment.

The risk assessment methods described in the CCS Publication include control-banding, Job Hazard Analysis, HAZOP and What-If analyses. ACS technical divisions are currently collaborating to identify ways to support this CCS Publication with ready access to electronic information resources. We believe that this guidance document can be used to outline a method for moving from raw data to appropriate management plans that meet the intent of OELs in these settings.

***Question IV.A.3**: OSHA is considering greater reliance on peer-reviewed toxicological evaluations by other Federal agencies, such as NIOSH, EPA, ATSDR, NIEHS and NTP for hazard identification and dose-response analysis in the observed range. What advantages and disadvantages would result from this approach and could it be used in support of the PEL update process?*

Public peer-reviewed data sources are core to the risk assessment methods described above and we believe that they provide a prudent opportunity to address situations when data is lacking. The attached ACS policy statement specifically addresses limitations in current Agency risk assessments and makes specific recommendations for improving the process. For example, the ACS recognizes that "risk is a function of hazard and exposure" and that without quantified measurements indicating a level of exposure to a chemical, persons will define what is "safe" based on the information that is available to them. To support this strategy, the quality of the information used by those conducting these assessments must be validated and "the best available scientific information". The ACS supports use of a "framework for risk-based decision-making" and suggests that United Sates government agencies should create common frameworks for dose-response

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[1] [CCS Publication] Identifying and Evaluating Hazards in Research Laboratories http://www.acs.org/content/dam/acsorg/about/governance/committees/chemicalsafety/identifying-and-evaluating-hazards-in-research-laboratories-draft.pdf (verified 5 Dec 2014)

assessment and should participate in international efforts such as ongoing development of the Globally Harmonized System (GHS) and OpenTox Foundation.

Insofar as OSHA relies on other Federal agencies' risk assessments, OSHA should ensure that the approach used in developing these assessment is scientifically reviewed and includes appropriate estimates of uncertainty, as described in the ACS policy statement. The quality of the data used in these determinations is integral; in order for OSHA to promulgate a health standard using peer reviewed information it should limit sources to those that publish manuscripts reviewed by multiple reviewers.

> ***Question V.A.2.*** *How might the information on the properties and toxicity of chemicals generated by CompTox, ToxCast, and/or Tox21 be utilized by employers to identify chemical hazards and protect workers from these hazards?*

While we recognize the opportunities presented by such tools, as described in the attached statement, we believe that it is important that the responsibility for hazard identification and assessment remain with the manufacturer of a chemical, as outlined in the Safety Data Sheet requirements of the Hazard Communication standard (29 CFR 1910.1200). Further, we believe that only the most well-resourced employers will have the ability to hire experts able to use the tools named in this question effectively.

> ***Question IV.C.1****: Should OSHA consider greater use of process oriented regulations, such as regulations on abrasive blasting, welding, or degreasing, as an approach to health standards? Should such an approach be combined with a control banding approach?*

We believe that the OSHA Lab Standard (Occupational exposure to hazardous chemicals in laboratories) is a good example of a process oriented regulation that has provided a valuable alternative to reliance on PELs in the laboratory setting. This approach is predicated on the clear definition of "laboratory scale" and "laboratory use" in the Standard; such well-bounded process descriptions are necessary to support this type of regulation.

> ***Question V.B.1*** *To what extent do you currently consider elimination and substitution for controlling exposures to chemical hazards?*

Elimination and substitution are the highest order of hazard control in the hierarchy of controls for risk reduction. These are considered before engineering and administrative controls primarily due to the greater ease of implementation; they are also at the core of Green Chemistry methodology.[2] The ACS Green Chemistry Institute promotes the principles of Green Chemistry and Green Engineering and provides education and opportunities for collaboration.[3] Through this institute, the ACS encourages laboratory workers and other chemical users to use less hazardous chemicals as an initial form of protection against exposure.

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[2] Paul Anastas, Ph.D. and John Warner, Ph.D., *Green Chemistry: Theory and Practice* (Oxford University Press, 2000)

[3] ACS Green Chemistry Institute, http://www.acs.org/content/acs/en/greenchemistry.html (verified December 23, 2014)

V.B.4: *What information and support do businesses need to identify and transition to safer alternatives? What are the most effective means to provide this information and support?*

ACS supports government agency efforts in enabling sustainability in laboratories.[4,5] Green Chemistry and Engineering principles, utilized in EPA's Design for the Environment program, has been shown to be an effective guide to substitution opportunities in many chemical uses; developing a strong partnership with the Green Chemistry Institute and associated programs should be a key strategy for OSHA to develop a living risk assessment program. A database of suitable substitutions that is searchable by chemists as they prepare their experiments would support the transition to safer alternatives. The value of this approach has been demonstrated by several efforts already initiated by the private sector, such as Sigma-Aldrich's Global Citizenship effort[6] and Green Solvents web app from Molecular Materials Informatics Inc[7].

Question V.B.8*: How could OSHA use the information generated under HazCom 2012 to pursue means of managing and controlling chemical exposures in an approach other than substance-by-substance regulation?*

The GHS hazard statements and precautionary statements can be used to support a control banding approach to specific uses of hazardous chemicals ***if they are also supported by a chemical hazard management plan specific to the workplace in question***. For example, in laboratories, the GHS classifications, in concert with a Laboratory Ventilation Management Plan, can support determinations of general ventilation rates appropriate for a particular lab. Similarly, but distinctly, the GHS classifications can be used, in conjunction with a Chemical Management Plan to establish the administrative (i.e., supervision and training requirements) and personal protective equipment (PPE) needed to perform a specific procedure at an acceptable level of risk. This strategy is more fully discussed in the CCS Publication (see section 3.2).

Question V.B.10: Please describe your experience in using health hazard and/or control banding to address exposures to chemicals in the workplace.

Control banding processes have been used at Cornell University in the setting of general ventilation rates in laboratories[8]. In this setting, control bands are used to control exposure

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[4] Sustainability and the Chemical Enterprise. http://www.acs.org/content/dam/acsorg/policy/publicpolicies/promote/chemicalenterprise/2011-10-sustainability-and-the-chemical-enterprise.pdf. (Verified December 8, 2014).

[5] Inherently Safety Technology for Chemical and Related Industrial Process Operations. http://www.acs.org/content/acs/en/policy/publicpolicies/promote/ist.html (verified December 8, 2014)

[6] Sigma Aldrich web site http://www.sigmaaldrich.com/globalcitizenship/environmental.html (verified March 27, 2015)

[7] Green Solvents web app http://molmatinf.com/greensolvents.html (verified March 27, 2015)

- [8] Ellen Sweet, Ralph Stuart Identifying general laboratory ventilation requirements using a control banding strategy, *Journal of Chemical Health and Safety, Volume 21, Issue 1, January–February 2014, Pages 9-14*

to airborne chemicals, controlling heat or odor, and identifying when point source (local) exhaust is needed. Discussions around this strategy occur during design for renovations or new construction and also when there are health and safety concerns reported by lab workers.

These bands are defined as part of the Lab Ventilation Management Plan based on ANSI Z9.5, which is structured according to the ANSI Z10 standard for Occupational Health and Safety Management Systems. The process includes a visit to an individual lab by a qualified person, as named in the Lab Ventilation Management Plan, and is documented for periodic review along with other elements of the management system.[9] This approach serves to make observations of chemical storage and use (including location of use with respect to the effectiveness of the general ventilation) without solely focusing on the regulatory requirements.

A different control banding process has also been used in the University of California system to establish Personal Protective Equipment and other requirements for laboratory workers[10]. A similar management system approach supports this strategy by defining the roles and responsibilities of health and safety staff, laboratory supervisors and laboratory workers in implementing this system.

It is important to recognize that any control banding scheme must be supported by management plan that describes the scope of the scheme and the roles and responsibilities of management and labor in implementing the scheme. An example is of this is the approach to environmental management system developed by the Society of Chemical Manufacturers and Affiliates (SOCMA) in the "ChemStewards FOR LABS"[11] program.

> **Question *V.B.13***: *How might OSHA use voluntary guidance approaches to assist businesses (particularly small businesses) with implementing the principles of hazard banding in their chemical safety plans? Could the GHS chemical classifications be the starting point for a useful voluntary hazard banding scheme?*

Small businesses, particularly those with annual gross receipts of less than $50 million USD generally lack the technical resources to implement a complex regulation with internal resources. The concept of a voluntary implementation of hazard control banding is sound; however, its implementation will be quite different in different workplaces. For example, if an abrasive blasting workplace, a welding workplace, or a degreasing workplace were each using a product classified as ACUTE TOXICITY DUSTS & MISTS, Category 3 and SKIN CORROSION/IRRITATION, Category 1B, very different controls will be needed. The informed assessment of the most beneficial and cost effective controls will require a high degree of experience and technical expertise.

The most effective Control Band model for laboratories – the CDC's Biological Safety Levels – works because these workplaces have similar hazards and similar approaches to

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[9] Cornell University Laboratory Ventilation, http://sp.ehs.cornell.edu/lab-research-safety/chemical-safety/lab-ventilation/Pages/default.aspx (accessed December 8, 2014)

[10] http://blink.ucsd.edu/safety/research-lab/chemical/chua.html#CHUA%27s-hazard-control-plan-temp

[11] Society of Chemical Manufacturers and Affiliates, ChemStewards FOR LABS, White Paper, October 2014

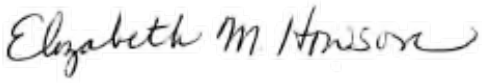
risk management. There are a number of current peer-reviewed publications[12] which address this in detail.

We note that the United Kingdom's Health and Safety Executive has established an important model in this respect with its Control of Substances Hazardous to Health (COSHH) program. Their Essentials web tool model uses control banding concepts to help small employers to identify appropriate hazard control strategies for their workplace. It is important to note that this tool has specific limitations and identifies situations where further expertise is required to address specific issues completely.

We applaud OSHA's initiative to update its Permissible Exposure Levels. We at the ACS stand ready to further assist this effort as it proceeds.

Signed,

Debbie Decker, 2015 Chair, Division of Chemical Health and Safety



Elizabeth Ann Howsom, Chair, Committee on Chemical Safety

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[12] David M. Zalk, Ga Henri Heussen Banding the World Together; The Global Growth of Control Banding and Qualitative Occupational Risk Management, *Safety and Health at Work, Volume 2, Issue 4, December 2011, Pages 375-379*

Public Policy Statement
2013-2016

Chemical Risk Assessment and Regulatory Decision Making

The American Chemical Society (ACS) vision of improving people's lives through the transforming power of chemistry requires an appropriate understanding and management of the risks that chemicals may present throughout their life cycle. Risk assessment is the first step in the risk management process. This statement provides principles and recommendations for risk assessment, particularly with regard to government regulation of chemical commerce.

The use of commercial chemicals in medicine, agriculture and other components of the marketplace have improved human health and quality of life. It has also caused some adverse impacts to human health and the environment. The ACS believes that proper design and management of the synthesis, production, use and disposal of chemicals can maximize their utility and minimize their potential adverse impacts. Here, we offer risk assessment principles and recommendations to achieve this balance.

For example, ACS supports the use of green chemistry and engineering principles to develop and use safer chemicals. However, ACS recognizes that the definition of "safe" differs among individuals. In the context of national and international efforts to protect human health and the environment, "safe" is defined by legislators, implemented by regulators and adjudicated by the courts as a level of acceptable risk. These actions are informed by science, but are based on values, politics, economics and other social factors. The proper use of science is to inform decision makers about the inherent hazards and the likelihood of adverse health or ecological effects from particular exposures. Scientists can also assess the strength of evidence, and the uncertainties and variability of currently available information. Such risk assessment information should be considered by decision-makers, but cannot on its own be used to determine what is "safe."

Risk assessment entails three "…analytic steps—hazard identification, dose-response assessment, and exposure assessment—and a fourth step, risk characterization, in which results of the first three steps are integrated to yield information on the probability that the adverse effects described in hazard identification will occur under the conditions described in exposure assessment. Uncertainty findings from the first three steps are also integrated into risk characterization." [NRC 2009] This process provides information for risk management decisions.

There is no single set of analytical tests to conduct risk assessment for the wide range of existing and possible chemistries. Rather, risk assessment is a process for selecting appropriate methods to evaluate the impacts associated with life cycle exposures to a chemical at the different stages of commercialization. New, more efficient tools are being developed for toxicity evaluation. Such progress was highlighted in the 2007 NRC report "Toxicity Testing in the 21st Century: A Vision and a Strategy" [TOX21] and the 2012 NRC report "Exposure Science in the 21st Century: A Vision and A Strategy" [NRC 2012].

American Chemical Society, 1155 Sixteenth Street NW, Washington DC 20036, 202-872-4386, www.acs.org/policy

Risk assessment science can be further advanced by the following principles and recommendations.

CHEMICALS RISK ASSESSMENT PRINCIPLES AND RECOMMENDATIONS

The American Chemical Society supports three key risk assessment science principles and makes the following recommendations for each:

1. Evaluations of chemical safety should be reviewed and informed by sound science and reflect risk-based criteria protective of human health and the environment.

- Risk is a function of hazard and exposure. The risk posed by chemical substances must be judged using transparent, published, and state-of-the-art risk assessments that incorporate the best available scientific information, regardless of source. Such risk assessments must inform the regulation of chemical substances and processes.
- ACS supports adoption of a framework for risk-based decision-making as outlined by the National Academy of Sciences in "Science and Decisions: Advancing Risk Assessment." [NRC 2009a]
- Risk assessments should be tailored for the type and level of information needed to inform the decision. Less detail is appropriate for low risk/low economic consequence decisions compared to high risk/large economic consequence decisions. Priorities for doing risk assessments need to reflect risk considerations, including
    - scientific understanding of hazard.
    - structural activity relationships.
    - volume in commerce.
    - use (i.e., whether the chemical is in children's products or a community has disproportionately high exposure levels).
    - detection in biomonitoring programs.
    - persistent and bioaccumulative properties.
    - adequacy of available risk information. [OECD]
- Federal agencies should clearly state the default assumptions and underlying reasoning they use to assess risk.
- Risk assessments need to clearly state the level of uncertainty and variability of the data.
- To the extent practical, agencies should develop common frameworks for dose-response assessments to take into account exposure scenarios and exposed populations. Risk assessments should appropriately take into account population variability, stressor exposures, and cumulative chemical exposures when risk potential is high.
- ACS supports prompt development of more efficient, biology-based validation methods to certify the results of appropriately designed toxicity testing and exposure assessment.
- ACS supports implementation of the recommendations of the National Research Council "Report on Toxicity Testing in the 21st Century" and the application of its principles to ecological risk assessment. An understanding of appropriate biological targets and modes of action can be used to develop less costly and more efficient and informative tests to aid risk assessment, such as *in vitro* assays and predictive models. [TOX21]
- U.S. federal agencies need to participate in international efforts to (a) establish adverse outcome pathways for key toxicity endpoints and (b) replace traditional toxicity tests with more informative and efficient tests that reduce or eliminate the use of animals.
- Agencies should have adequate resources to advance the science of risk assessment.

- National governments should work together to further develop and use risk assessment science and findings.
- ACS supports better understanding of critical risk assessment science specifically in the areas of
    - Endocrine Disruption: Endocrine disruption is the alteration of the endocrine system that causes adverse health effects in an organism, its progeny, or a (sub)population. ACS supports (a) expansion of endocrine disruptor education and research, (b) more rapid advancement by the EPA of the congressionally-mandated Endocrine Disruptor Screening Program effort, and (c) support for green chemistry research to identify and develop functional alternatives that do not have endocrine disrupting activity.
    - Exposure Assessment, including Biomonitoring: ACS supports the "Research Needs" identified in "Exposure Science in the 21st Century: A Vision and A Strategy" [NRC 2012]. These include exposure assessment to move to an integrated approach that considers exposures from source to dose. There should be continued support for biomonitoring research.
    - Nanomaterials: As recommended by the NRC, the government should build on the current research base and develop a national strategic plan for nanotechnology-related environmental, health, and safety research. The strategy should focus on studies that support the risk assessment and risk management of nanomaterials to ensure their timely and safe development. [NRC 2009b]

2. Companies that manufacture, import, process, distribute, or use chemicals should provide the information necessary to conduct risk assessments.

- The commercial chemical enterprise should have sufficient information to conduct risk assessments for their products' intended uses.
- The commercial chemical enterprise should be required to provide information necessary for agencies and manufacturers to conduct risk assessments.
- Health and environmental data should be transparent throughout the value chain as appropriate to the user; however, legitimate confidential business information should be protected.
- Companies and government should work together to ensure a balance that maximizes public access to chemical health, safety and environmental information.
- Government, the chemical enterprise, the commercial value chain and consumers each have roles in responsible chemical risk management. Those developing, manufacturing, processing and distributing chemicals need to provide information and guidance about safe use. Consumers need to follow that guidance and use the materials safely. Timely and accurate risk communication is essential.

3. Green chemistry and engineering principles should be used to support sustainability goals.

- Chemicals management and regulatory policy should encourage technological innovation and a globally competitive US chemical industry. Advancing research and applying appropriate principles from green and sustainable chemistry and engineering will lead to economically viable, technical innovations. [GC-GE] To this end, ACS supports the government implementation of

- Financial incentives (tax incentives, grants, awards, preferential treatment in government purchasing) for the development and deployment of greener chemicals and processes.
- An expedited regulatory process to incentivize adoption of green and sustainable chemical products and processes. The government should work with industry, academia, scientific organizations, public interest groups, and other stakeholders to develop standards for use in such a regulatory scheme.
- Continued support for research and development by universities, industry and other stakeholders to make new alternatives available and encourage their adoption.
- Support for the training and education of chemical scientists to more uniformly prepare them to understand toxicity and exposures (i.e., risk) associated with chemicals.

REFERENCES

[TOX21] National Research Council, 2007. *Toxicity Testing in the 21st Century: A Vision and a Strategy*

[NRC 2009a] National Research Council, 2009. *Science and Decisions: Advancing Risk Assessment.*

[NRC 2009b] National Research Council, 2009, *Review of the Federal Strategy for Nanotechnology-Related Environmental, Health, and Safety Research*

[NRC 2012] National Research Council, 2012, *Exposure Science in the 21st Century: A Vision and A Strategy*

[GC-GE] Green Chemistry and Engineering Principles

[OECD] Guidance Document on the Use of Multimedia Models for Estimating Overall Environmental Persistence and Long-Range Transport