# Meaningful and Concise Safety Summaries for ACS Publications (Originally Broadcast Live on January 23rd, 2020)

**Michael David:** Hello everyone and welcome to ACS Webinars, connecting you with the best and brightest minds in chemistry live every Thursday from Washington D.C. I'm Michael David, and I am pleased to be your host for today's broadcast, which may be setting the record for the most co-producers we have ever had. These are the ACS Division of Chemical Health and Safety, the ACS Committee on Chemical Safety, the ACS Technical Division of Chemical Information, and ACS Publications.

[00:00:30] Beginning in 2020 ACS Publications has enacted a new requirement specifying that authors address safety concerns and work submitted for publications in all ACS journals. Today, we will be joined by Sammy Sigmann of Appalachian State University and the ACS Division of Chemical Health and Safety, Leah McEwan of Cornell University and the ACS Division of Chemical Information, and Sara Tenney of ACS Publications as they discuss the new chapter, "Communicating Safety Information" from the 2020 ACS Guide to Scholarly Communication. Over the next hour, you will discover how to develop meaningful and concise safety summaries for manuscripts based on risk assessment. Now, in just a moment, I'm going to turn it over to Sara to get today's presentation started, but before that, we have a poll for all of you.

[00:01:16] Do you currently include safety summaries in your publications? And the choices you have are no, not currently, no, but you would like to add them, yes, or not applicable to my work.

[00:01:31] All right. It looks like 39% said it's not applicable to your work. 12% said yes. 29% said no, but you would like to add them and 20% said no, not currently. So thank you so much for sharing that. And with that, I am going to turn it over to Sara to get today's presentation started.

[00:01:48] **Sara Tenney:** Thanks, Mike. Hi everybody. I have the good fortune of being able to sort of provide an overview of what we're going to get into today with Sammy and Leah. And what I just wanted to take a moment and let you know about, is that we have a new version of the ACS Style Guide that's launching this month. And it's been rebranded as the ACS Guide to Scholarly Communication because, we cover so much more than style these days and one of the topics that we cover, in a, in a chapter authored by Sammy, and Leah is a chapter on, lab safety. So just to quickly run you through the website. Here is the website which if you, would like to gain access, you can request a trial access. But, it's completely digital. And the first, the last two parts really focus on style issues of style that are pretty static.

[00:02:42]But then as you move up the table of contents, we have an entire part on data, which is a moving target in many ways and an area where we are going to be wanting to, update the content. Part two is a comprehensive treatment of scientific journals, publishing and in scientific articles.

[00:03:00] And then part one covers a lot of the more moving and evolving topics; chemistry preprints we have a chapter, open access is coming soon. And then here we have the chapter on communicating safety information. So what's great about this online format is that Leah and Sammy can update the content as these requirements change or as we get feedback from you about  additional tips and things that you'd like to see, in that coverage.

[00:03:30] We'll be updating it twice a year with not only updates to a chapter, but also updates to a particular part where we'll be adding additional chapters as well. So it's quite dynamic and we're very excited and very excited about lab safety.

[00:03:46] This is just, again, an outline of what's covered in the chapter on communicating safety information. And this is what we'll be getting into today. So with that, I'll turn it over to Leah.

[00:03:59] **Leah McEwan:** Thank you, Sarah. I'm really excited about the guide coming along, so let's jump right into the topic for today. I know in chemistry, we experiment with, with novel chemistry, we push the boundaries.

[00:04:13]That's what we do. And so thinking about how to do that responsibly and productively is, is the topic that we're gonna be focusing on today. A decade ago this month, a chemistry graduate student at Texas tech university was severely injured when a high energy metal compounding suddenly detonated.

[00:04:30]You know, this research was part of a multi institutional research project to characterize potentially energetic materials. So they knew that they were handling these and the student, in this instance, the students involved in this instance were scaling up their synthesis by two orders of magnitude to provide enough sample so that all testing could be formed on one batch.

[00:04:50] And, you know, so I thought that this was a, it was a very tragic accident and it illustrates very well, you know, that, you know, we know even when we know we're working, with potential hazards, it can be very hard, to manage the process. On the chemical safety board did investigate this incident and reported on it in 2011.

[00:05:09] There's a link on the screen there to their report. And that's a screenshot, of the webinar that the CSB produced. I'm not going to show it today but just a few more comments from the CSB report. And the CSB found that there have actually been two prior near miss incidents of a similar nature in this work and that very little follow-up had really happened to prevent, you know, reoccurrence of this type of concern.

[00:05:34] For example, there was no former hazard evaluation risk assessment that had been completed. The students sought peer advice and no policy was in place in the laboratory department or university level.

[00:05:46] To prompt students to seek advice from their principal. Investigators or to evaluate the experimental activities. So in this case, the scale up, was not considered in terms of, being prepared for any potential  concerns that would arise  from scaling up to that

level. So, you know, some takeaways, scale up of energetic materials has a high potential for danger.

[00:06:09]New students may rely on peers who themselves may not be aware of previous incidents, and lessons from near misses that are not incorporated into procedures or other documented policies and practice cannot be learned by others. And we think about the academic environments, very dynamic, students and other lab workers are coming through, you know, every few years.

[00:06:29] You know, this communication, it's critical, to consider people downstream from the research that you're doing, who will be working with this chemistry. You know, both within your project, the students who are coming into the project later, but also other scientists who may be doing this work. So the question we are really exploring today in this webinar is how to effectively communicate these lessons that we garner from practicing chemistry, and specifically incorporating these into, into research publications.

[00:06:59]So ultimately the chemistry community has a shared goal to contribute productively to the chemical sciences, right? You know, so if we look at this pyramid of, of, social responsibility, that you know, that that's the underlying goal that we all share, is to contribute productively.

[00:07:15] And then, at the legal level, the OSHA laboratory standard provides that, that framework and that foundation for our, for our legal responsibilities, while working in the research environment. And then also the ACS, has, has drafted several professional guidelines and statements about professional practice.

[00:07:33]You know, particularly considering the ethical responsibilities of participating and contributing to our profession of chemistry research. In these statements, they actually include this statement about addressing safety and health issues when you're contributing to the scientific literature, particularly if you're working with some type of high hazard.

[00:07:54]You know, and, and including this kind of communication really elevates the practice, for every individual to contribute to that collective responsibility that, that we have as, as a social group. It enhances the knowledge of reactive chemistry and process optimization for all of us if we report some of these types of situations working with hazardous materials. And it also helps us to be proactive, particularly in, say, academic settings, given that dynamic nature of the lab operators, the students in particular, setting the example of mindful research practice, for these emergency emerging young professionals and respecting the health and wellness of all the community members, on our campus and in the profession.

[00:08:38] So in 2016, Grabowski and Goode did a study of the author guidelines for several hundred, over 700 chemistry related journals from 28 different publishers . And what they found, they were looking for four key words that have something to do with safety, caution, hazard, safety, danger.

[00:08:57]They found only 8% included these keywords in the guidelines for authors who are preparing manuscripts. And this figure illustrates the result from some of the most

prominent publishers in chemistry. There was another survey done in 2017, where it was, we asked, the, the research community to report how, how often that they would include safety information in their research publications.

[00:09:22] And, the response was less than a quarter do this consistently. So it's not, it's not a regular practice, it has not been a regular expectation, in the journal literature, for chemistry to include information about safety. So you may have noticed, in that figure from the previous slide, the ACS was the only publisher that appeared to touch on some aspect of safety directly in the author guidelines across most of their journals.

[00:09:47]Nevertheless, this study, of the, of the guidelines and as well as several high profile like accidents, such as some Texas Tech, prompted ACS publications, editors and staff to review how the ACS journals address safety. And this resulted in a new requirement to note novel or significant hazards in 2017. All author guidelines for almost all ACS journals now include this statement, and this is updated as of December 2018 and I'll read this. it's very brief, but it is in almost all the journals.

[00:10:21] "Authors must emphasize any unexpected new and or significant hazards or risks associated with the reported work. This information should be an expandable section of the full article and included in the main text of a letter. And then some journals have provided some additional direction in Organic Chemistry, for example, also includes them that guidance right in their checklist to prompt you when you're preparing to submit your manuscript.

[00:10:47]The Journal of Organic Process and Research Development, given that the focus of the journal is on industry process, they also emphasize the importance of considering scale, and noting that, in your, in your safety statement. And then, of course, the Journal of Chemical Education, you know, has quite lengthy direction in the guidelines, for reporting safety information as a teaching tool.

[00:11:11] So the goal for including safety statements in scientific publications really is to alert readers to unusual hazards or procedures which presents significant risk or require special control measure beyond those that you would reasonably anticipate to be, present in your laboratory research or teaching laboratory.

[00:11:31] It's expected that scientists schooled in the art and follows following the published procedures that they're using would be appropriately prepared for commonly known hazards in this field of study. But hazards are inherent to many types of chemistry. And so safety summaries are really intended to help manage these hazards in the context of laboratory research and to communicate what we've learned about these in the course of doing our work downstream. Now I will pass it on to Mike for a survey question.

[00:12:00] **Michael David:** Our next question is how do you currently manage hazards in your lab? Do you do risk assessment, a standard operating procedures. Personal protective equipment, someone else manages the hazards. You don't really have to worry about it or common sense.

[00:12:20] All right, so 66% of you said you do risk assessment. 81% said standard operating procedures. 91 said personal protective equipment. 10% said someone else manages your hazards, and 59% said common sense. So with that, I will now throw it to Sammy to continue on with our presentation.

[00:12:38] **Sammy Segmann:** Thanks, Mike. So I wanted to speak to a little bit and I'm pleased actually to see that so much risk assessment is being done out there.

[00:12:46] And I would like to continue and talk about, risk and hazard in your local environment in this portion of the talk and how these might, this might drive your safety summaries. So when we're determining experimental hazard, we have to look at all aspects of the research, the chemicals, the science, your equipment and the environment where the research is going to occur.

[00:13:12] And we want to look at agents, which could be chemicals, which could have health issues such as toxicity or carcinogenicity, or they can be mutagenic, et cetera. And the physical hazards from chemicals, whether they're flammable or oxidizing. We also want to consider agents, since there's so much cross-disciplinary work now. If you have biological agents that you need to consider, anything that could harm  have a biological effect on people we're considering in the agents. Radiation would be another consideration. For conditions, we want to look at your processes that are occurring, the equipment you're using.

[00:13:51]Are you working with pressures or temperatures other than ambient? Are you working with asphyxiants? Even something such as, the clutter in the lab could, could factor in. For your activities, you're going to think of creating secondary products, and, and your physical ergonomics type things, lifting, pinch points, scale up would be here, transportation of hazard materials and your sharps and these type of things might be in this section of the activities.

[00:14:23] How do we think about organizing and determining this experimental hazard and organizing it into a way that we can communicate it to the downstream users. The ACS has adopted the RAMP organizing principle, and you can see here on the left of your screen that stands for to *Recognize* hazards, to *Assess* the risks presented by the hazards, to *Minimize* the risk, and then *Prepare* for emergencies.

[00:14:52] And on the right side of the screen, you see another organizing, diagram, which is called a fishbone, which is not terribly important, but what it does is it puts possible causes for a problem placed in relevant categories and then helps you solve the problems. So in this case, it's a completing a risk assessment, and we're going to look at high reactivity chemicals in there, some examples, acute or chronic health hazards, your unknowns, which is always possibility in novel research, process hazards, and then other considerations.

[00:15:28] These are known as triggers. The RAMP method of organizing data such as this is from Hill and Finster's Laboratory Safety for Chemistry Students, second edition. I think it was also in their first edition. So how do we recognize chemical hazards? Well, our best

mechanism to date for recognizing chemical hazard is using the globally harmonized system of classification and labeling.

[00:15:57] And you should be recognizing common pictograms. There's nine of them from GHS, and you want to, as Leah indicated, look at your high hazard first. And for GHS system, you're going to be looking for chemicals that are in low numbered categories and or letters. So anything in category one is going to be considered a significant hazard chemically.

[00:16:27] But don't forget, as with Texas Tech, you must consider hazards from all sources. So we're going to look at, can I remove the heat as quickly as I am producing it? Again, do you have some of those other category hazards such as nanoparticles or biological, radiation. And then you want to make sure that if you're working with, energetic compounds that you have stabilizing atoms on per the rule of six is as it's known that you have six of those per energetic functional group. And the one I've shown here is from a AAAS article called, "Things I won't work with." And you'd notice that you have two carbons for 14 nitrogens, very energetic material. Okay. So once you've identified, recognized your risk, then you're going to go into the next portion, which is assessing risk.

[00:17:22] And this is the most difficult part. I teach a risk assessment to a lot of students, and this is the most difficult part to teach and to, evaluate when you're doing a RAMP assessment. It involves an art and a science and you have to have a lot of, pre knowledge to make sure that you're assessing at the right level. Much as based on our perception of risk and that limits our decision making capabilities. All researchers make fast decision on what we know, but we may not have the information we need to make the right choices. So this part of risk assessment hopefully uncovers holes in knowledge and enables better fast mind decisions when you're in the lab working.

[00:18:09] You can look at risk as a qualitative descriptor where you're looking at likelihood of something occurring in the consequence, should it occur? Of course the more likely it is and the some more severe of the consequence, the more extreme the result. And you can look at something like a nomogram, which, those of you that remember slide rules, this is where we're looking at probability exposure and consequence. It's a more quantitative type evaluation, but you mustn't ever forget the human factors, the things I already talked about, which is that we make fast decisions based on the knowledge we have. And you want to make sure you have the best knowledge possible.

[00:18:50] So for the Texas Tech example that Leah talked about at the beginning of our presentation, you might want to think about what the triggers were and. We had explosives, so we might say the likelihood and consequence were quite extreme that something could go wrong. They scaled up. We had a large mass or volume.

[00:19:14] They also assumed that the wedding agents they were using, hexane I believe it was what they were using, would wet the larger mass sufficiently before they milled it in the mortar and pestle. And again, this is where the art comes in. You know, somebody else might say that was more extreme. We also had some novice workers in the lab. While their fifth year graduate student had been around a while, he'd only been working on this project for about a year, and he hadn't received any training. He'd only done some research

literature research. So we also had not well classified hazards. So that added another layer of extreme risk to this process. So the other thing for assessment that we always need is reliable authoritative information.

[00:20:06] And in the chapter, in the  new style guide, we have given you, this is just a sampling of some of the reliable sources of information. You can go to the ACS. The ACS has developed many new, resources in the last five years. So they're up to date based on the globally harmonized system of, of labeling.

[00:20:28] And, you also can go to Prudent Practices, which is been around for a while, and it has  information relevant to academic laboratory scale. So it's a good resource. The National Institutes of Health information, resources of particular interests, PubChem, where you can get laboratory safety summaries for chemicals.

[00:20:52]They've got over a hundred thousand of those now. And so they're pulling in all the resources from, various databases, and it's a very good resource. CAMEO chemicals, which is NOAA's site, is an interesting one because you can simulate mixing chemicals in silico to see what the likely reactions are.

[00:21:12] You can also, if you don't know the exact structures you can put in functional groups, so you can see how a whole functional group might react. Very good for determining if waste are, can be combined. Good teaching tool as well. There's Bretherick's, which is, a very, it's in the eighth edition now, but it is a cumulative resource.

[00:21:35] And so it gives you a very good literature based information on reactive chemicals. And then, finally Not VooDoo X, which is a University of Rochester site. It is developed, was developed by, researchers and they have information for first time researchers, PhD students, and advanced researchers, and so people are going to put lessons learned here. It's a, it's a students like this resource a lot.

[00:22:05] So now we've recognized, assessed, and so what are we going to do to minimize risk? And, we're going to look at this hierarchy of controls, which is from NIOSH and National Institute of Occupational Safety and Health. And notice it's an inverted pyramid.

[00:22:20] This is their diagram, whereas effectiveness increases or decreases from top to bottom, so that the PPE is, and I noticed a lot of people selected PPE as their assessment method, that if it fails, you have exposure or, you know, an a consequence. So you want to make sure that you're operating at the highest level of your hierarchy of controls.

[00:22:44] One example of this is, and I'll tell the story of Karen Wetterhahn in case you've not heard this story, that in 1996, she was working with  dimethylmercury and, she had put as many controls in place as she could because she understood very well the hazards of this chemical. She had tried substituting another inorganic mercury salt to make her NMR standards, but it had not worked as expected.

[00:23:14]She'd tried substitution, she was working in the hood. She had another coworker come and help her open the ampule so that there was more hands on and then she had her

PPE on lab coat, but she had on latex gloves and unbeknownst to her, the penetration time on the latex gloves was less than 15 seconds when it was measured after the event.

[00:23:37] So she got a few drops of the dimethylmercury from the pipette on her glove and did not realize at the time the severity of that. And within a year she had slipped into a coma and did pass away from that event. So the point of this is to, even with all the protections in place, you've always got to do the last step, which is prepare for emergencies.

[00:24:03]And this one is often not thought about as deeply. So what you want to look at is where a loss of control could result in a significant danger. So this is the information also that you want to pass on in your safety summaries. What should you be prepared to do in case that the controls fail. And so you have to know this ahead of time. You can't be thinking of this after the event. It will provide the, your direction and focus for the researchers downstream and for your own lab. Toxicity is a difficult one to anticipate because if you're making new materials, you don't have any toxicity data.

[00:24:44] So, you know, you need to base it on maybe the highest hazards of the starting materials, but of their known toxicity. But it is one that is difficult if you want to know the signs and symptoms of exposure so that if it comes to the fact where you're having some difficulties, you can trace it back to that event.

[00:25:07] So what might a risk assessment look like? Well, this is a, a RAMP visual and this particular one's called a bow tie. It's not particularly important, but what you can see here is we've recognized that we have a flammable solvent, so we have some level of hazard. We've assessed that there's a possibility of a flash fire that could lead to a flame jet.

[00:25:32] This one particular a visual is for a high school incidents that have occurred in the last 20 years. We're going to minimize by putting some steps in place to prevent that hazard from occurring or that, that, event from occurring. And then we're going to prepare for emergencies on the other side so that we minimize consequences.

[00:25:57] Another example of what a RAMP tool might look like. This particular one is a job hazard analysis that's been put into a Excel spreadsheet and this one, you take a task and you break the task into steps and you recognize, assess, minimize, and prepare for each step of the process. You might want to have prompt questions because again, that assessment piece is very difficult for novice learners.

[00:26:23] So this is more on the teaching end of why you might do a risk assessment. The good part of doing this is that once you've done a risk assessment, you have all the information you need to put into your safety summary for your publications.

[00:26:38] **Michael David:** Alright, this is the last question we have for all of you today, and that is do you have any of these high hazard categories in your lab? And again, you can select all that apply, being high reactivity chemicals, acute or chronic health hazards, unknowns, hazardous process, or other considerations.

[00:27:00] And it looks like a fair number of you have. You have, most of the 61% said high reactivity chemicals, 74% said acute or chronic health hazards. 51% sent unknowns, 55% said

hazardous process, and 37% said other considerations. And with that, I'm going to turn it over to Leah to continue on with our presentation.

[00:27:20]**Leah McEwan:** Thank you very much. Now we'll take a few minutes to look at what goes into crafting an effective safety summary. So in the chapter, we actually include a checklist and you can see a snapshot of it that they are on the left side of this screen of the types of information you could actually include from your risk assessment, into a safety summary, in the article.

[00:27:39] And again, ACS suggests that the safety summary could be included in the experimental section, of the article or in the main text if it's a letter. You know, cause it's in the context of doing the experiment that, that these type of considerations arise.

[00:27:53] Not all of these items will necessarily apply to all procedures and there may be other specific issues of note, that arise for novel research that we haven't called out here but this is just sort of to give you a sense of, you know, a prompt to think about if these are relevant things that you, you might want to note. Many people are familiar with the globally GHS symbols that Sammy was showing earlier, and the SDS information sheets provided by manufacturers of your reagents.

[00:28:22] And these are good starting points, to look for some of this information. However, these statements are general to any situation where these chemicals may be used and, and do not necessarily address the hazards that are called out in the fish bone that Sammy showed earlier, or within your specific context of how you're using them.

[00:28:40]You know, for example, novice workers, it's not something that's going to be considered, on the SDS and what you may need to do to help prepare for training of specific things. So your safety summary really should not simply restate an SDS for the starting chemicals used in your experiment.

[00:28:56]You'll, you'll often need additional information sources. You want to emphasize the substances with notable hazards. And don't forget to think about intermediate solvents, catalysts, and other reagents, as well as products you know, that that may also present hazards in addition to the starting materials.

[00:29:13]If you are working with novel compounds, you may want to consider the hazard classification of the closest analog, or, and, or look at the functional groups. I'm just reemphasizing that here. And mitigation and, and protection, beyond basic PPE and that kind of essential emergency procedures that are in place in most institutions.

[00:29:32] Anything beyond these is especially critical to note because that this is the last barrier between you and injury, as Sammy was describing with the bow tie visual. This checklist is available in the chapter and I, I believe it would be available for anyone to download a copy locally, if that's helpful.

[00:29:53] So when you're thinking about going from the risk assessment process that Sammy walked us walked us through and formulating useful statements, from those, here

are some points you might want to think about. Particularly calling out the mitigation if there's a risk, this is, you know, that way everyone doesn't have to reinvent the wheel.

[00:30:11]And, you know, it just gets people started in the right place. Again, the scale is a really critical issue, comes up a lot amongst reported instance. Again, any needs, special needs for specialized emergency control equipment that may not be not commonly there or, or, something you'd normally think about.

[00:30:33]And then also if you've noted special maintenance requirements in your experiment, that might present hazard downstream the second time you go to use it. That, you know, that's a kind of a semi unique thing. So for example, this one here, you know, if you have a serious fouling in something like an over pressure relief valve, then that's something you definitely want to make sure you're cleaning out, before every repeat of that reaction so that you don't have this concern, about watching, potential pressure issues.

[00:31:01] So I'm just going to show a couple of examples and spin through these fairly quickly so we can get on to answering your questions. These are from the chapter. They've all been reported in the literature. So I included this one here because it calls out the, the hazard, with tert-Butylithium.

[00:31:16]And in 2008 a student at UCLA who was a worker, you know, experienced a fatal accident, handling tert-Butylithium, that she basically scaled up, the amount she was working with, beyond the capacity of the equipment that she had and didn't have a lot of training background and working with this material.

[00:31:34] So, in response to that, Organic Syntheses, which is the source of this, posted this, safety summary on all, all procedures that use this to emphasize how important it is, to use the right equipment when handling, very dangerous chemicals and to not overscale beyond the capacity.

[00:31:52] Here's another example of a safety summary that includes some helpful information about this compound.

[00:31:59]it is a highly toxic one. And so they also, the author in this case also included a note about an antidote should you, should you be exposed, to this during the course of your experiment. And, this hearkens back to the, the story about Dartmouth, that Sammy told earlier when she was fatal, exposed, to the very toxic agent that she was working on, there.

[00:32:22] So having some information right to hand about what to do should you be exposed. Again, that's part of that special emergency procedure. I'm just going to skip through really quickly here. Thinking about a teaching audience, you might want to think particularly about, what things may not be as obvious, to students.

[00:32:40] You know, it may not be enough to just say, you know, solvents are, are, are flammable often, and so you should handle them carefully. You just might need to call out what you do to make sure you're handling that carefully. Make sure you're in a fume hood. Make sure you're thinking about where the hazardous waste goes, what kind of gloves they should be wearing.

[00:32:59] So, teaching audience, again, like for the Journal of Chemical Education, is an additional opportunity to work some learning moments into crafting the safety summary, both when, when authors contribute to that journals, but also as students are creating, these assessments, for the labs that they will be doing in the teaching lab.

[00:33:17] We hope you're all starting to incorporate risk assessment into your teaching laboratory. And I just wanted to close with this final thought that, you know, utilizing these risk assessment methods that Sammy, quickly reviewed, it really streamlines that documentation process for when you're going to prepare a safety summary.

[00:33:35]You know, and the risk assessment is incorporated right into your experimental design and all of the, your mitigations, are more efficiently implemented.

[00:33:50] **Sara Tenney:** So just one last, a bit of information about the ACS guide, the chapter on lab safety among others. If you are interested in your institution subscribing, you can reach out to me and I can forward that information to a sales and marketing. Or you can have your librarian reach out to our sales and marketing team.

[00:34:09] If you'd like to get an individual access for yourself, please also email me as well. We have one month trial access.

[00:34:16] **Sammy Segmann:** The newest journal is the ACS Chemical Health and Safety. And it is now accepting papers. And our editor in chief or their editor in chief is Mary Beth Mulcahy. And, you can read now online publications of immediate for immediate release. And they are available right now to read.

[00:34:35] **Sara Tenney:** Just before we get into some of the questions, many of you had really helpful feedback as well. And, also mentioned a number of useful books that you use around lab safety. So, one was the emergency response guide that firefighters and hazmat teams use.

[00:34:55] The NIOSH pocket guide to chemical hazards, which has been brought up. And then, finally, a publication called Prudent Practices, which is available for free at the National Academies Press website. So the first group of questions that I'm gonna focus on here to have, Sammy and Leah to answer are questions around, writing lab safety summaries in your research paper.

[00:35:20] One of those questions that was asked, Leah, is do the lab safety summaries count towards your word limit? Dawn asked this question.

[00:35:32] **Leah McEwan:** Yeah. Well, that's a very good question and I, but I don't know that I could address it. I'm not one of the editors for the ACS journals, so I think that's definitely one, Sarah, that we're gonna want to bring back to your colleagues in the journal publishing.

[00:35:44] **Sara Tenney:** Okay, we can do that. Dawn, I'm, I, my, my thought would be that yes, it does. So, I'll, I'll confirm that and let you know.

[00:35:57] Another question was, and I think you answered it later. I think Leah, you answered this, which was, Drew asked this question, will there be a different section in the journal to talk about hazards associated with the research work.

[00:36:17] **Leah McEwan:** So I think I'm, for the ACS Publications general guideline that I read earlier, directed, in the experimental section because as part of that work, however, I think it's a, it's a matter of working with the editors of each individual journal about how it fits in into each article probably?

[00:36:36] You know, the publications have, has kind of left it more broadly to the editors of different journals to confer on that. I haven't seen much else, you know, in other, with other publishers where this should be included. But when I've, I've heard of it, you know, when I've seen it referred to a certain section, it's almost always been in the experimental.

[00:36:55] Occasionally, I guess I've also seen it referred to, including supplemental information that has more details about any specialized safety procedures you may have had to incorporate.

[00:37:08] **Sara Tenney:** Okay. Thank you. Here's a question from Elizabeth, for Sammy. Sammy should hazards of reactions already known to be hazardous, also be included?

[00:37:19] **Sammy Segmann:** So I would direct this to thinking about the audience that the, the, manuscripts being written for, if it's being written for, you know, the research level, possibly not.

[00:37:32] But again, you have to remember that it may be a novice worker. Undergraduates are doing so much research now that they're picking up and going with the procedure and possibly won't get enough guidance from their PI. So, you might just put a statement that, they need to check on the, hazards of the material and then put the higher hazards in their statement.

[00:37:57] And then if it's for a teaching audience, with the methanol fires that we've been seeing in high schools, it's clear that they just do not have the experience to understand the hazards they're working with. So I would say if it's a teaching article for teaching audience, that they definitely want to put even the lower level hazards in that could result in a severe consequence.

[00:38:19]**Sara Tenney:** Excellent. Thank you. Here's another question for you, Sammy, how do you track the chemical inventory to be more specific? How do you track the chemicals, quantity, etc. purchased by PIs at Appalachian State?

[00:38:35] **Sammy Segmann:** Well, it's not really relevant to this particular talk, but, we are very fortunate here in that I do all the ordering for everybody.

[00:38:43] So, I have a really good idea of what's coming in. And we also, the university has an electronic inventory system that we purchase, and so everything gets barcoded and put into our system. So we are very fortunate here, right now in how chemicals are tracked in the chemistry department.

[00:39:01]**Sara Tenney:** Here's another good question, for Leah. This one is from Ralph. Okay. Can ACS develop an electron, and I guess I could also answer this too, but can ACS develop an electronic template for best practices in organizing the information suggested by this system?

[00:39:21] **Leah McEwan:** I think some work could be done on creating a template to, I mean, we started with the checklist as that sort of more of a tool to prompt the kind of things you might want to think about when you've done your, you know, what to pull out of your risk assessment.

[00:39:33] There's not going to be a, you know, one form fits all, but I think there could be some interesting work. One thing that I think could also be interesting as ACS had, and publications has a fairly extensive reviewer lab, that they've prepared for training for people who review articles .We also do that as well as publish, and there's a little bit of information there on safety, but if, you know, if, if more people are publishing information about safety in these journals, that's another place where we could kind of think about, what reviewers could be looking for to see if what's being reported, is useful and communicative.

[00:40:07] And I'm sure ACS Publications may also want to think about how else they're supporting this requirement.

[00:40:14] **Sara Tenney:** We're also looking into, you know, the keywords, right? That we can put in these so that they can be indexed well on searches.

[00:40:22] **Leah McEwan:** Yeah, that's a really good point. I mean, we didn't really speak to that in the webinar today.

[00:40:26] That there, the committee on chemical safety, has been working on developing some, some, you know, key words and that would be great to pull that into the chapter, you know, suggested keywords to incorporate into your safety summary that will help with downstream discovery of this information and indexing.

[00:40:44]**Sara Tenney:** Leah, here's another question. How can we, from Lauren, how can we convince researchers to include safety information in publications that don't necessarily require it? Are other publications heading in this direction?

[00:40:59] **Leah McEwan:** I must say that's a good question. For engineering, it's an engineering.

[00:41:03] **Sara Tenney:** Oh, okay. Excellent. Oh, in the engineering community.

[00:41:06] **Leah McEwan:** Yeah, and I'm, I'm less familiar with the literature, in that area. It would strike me though that maybe some of that literature, is being, you know, is more closely associated with industrial processes. And in chemistry we've found that that literature is more cognizant of safety.

[00:41:21] So it'd be interesting to explore, the engineering, you know, how safety is being, discussed in the engineering context. You know, how to incite researchers. I think that's part of what we're trying to do here is just encourage that communication. And I think it,

someone else in the questions, I don't know if we'll bring this one up or not, but they were asking if the lab standard covers students.

[00:41:42]That's a gray area depending, whether or not the student is being paid and who's paying for them and all kinds of other issues about employment. You know, and then not all are researchers working with chemicals may think of themselves as chemical professionals. So those social lab standard and ACS ethical guidelines that I mentioned before, may not seem to apply to everyone, but this is an opportunity regardless of whether it's a requirement in your publication or not to share what you've, you know, how you've improved your procedure, with your colleagues so that they can also work on this chemistry that involves dangerous situations, you know, and be productive.

[00:42:19] So I think it's a compelling message, but it is, it will take a little more thinking and a little more effort, but I think it's all for better. Your, your, your experiment improves when you take the time to do risk assessment because you're thinking right during the course of your experimental and design how to, how to optimize the process.

[00:42:37] I wanted to note, I was looking at the questions, that if appeared, many of them I think are also further addressed in the chapter. So we didn't have time today to go into full detail and everything. The chapter actually addresses many of these excellent comments that have come up, including some of those other information sources.

[00:42:55]**Sara Tenney:** And thank you, Leah. That's, that really is, and another reason why this being a dynamic chapter and that we can update it every six months will be of great value. I just wanted to address one that I'm seeing here in the list. it should be made clear that ha, and this is from, while I don't see who this is from, but it should be made clear that hazard assessment, risk assessment is a living document.

[00:43:17] This is such an important comment. These are not static. And if you have any kind of change in your process, you have to revisit your, risk assessment and see how those changes might affect the outcomes.

[00:43:31] **Leah McEwan:** Yeah. Very good point. Another point that I thought that someone made that I thought was really, is something that, you know, is increasingly accessible to us is to provide videos around hazards rather than just, descriptions.

[00:43:46] Mmm. Which I think, and their point being that younger readers, you know, are so much more impacted by video. And of course a video can demonstrate a hazard pretty efficiently. So they suggested considering videos as part of your, lab safety summaries.

[00:44:04] **Sara Tenney:** Yeah. That's great. That's great. You could actually show techniques or something in the supplemental material or something like that, right?

[00:44:12] **Leah McEwan:** Yeah. I think the committee on chemical safety has also been working, on how to, you know, make those, make videos more available. So that could be a fun collaboration to have, if the authors are contributing videos, you know, to kind of coordinate that access, make them available as broadly available as possible.

[00:44:30] **Sammy Segmann:** And possibly they could be communicated on Not VooDoo X.

[00:44:35] **Sara Tenney:** Okay. I have a few liability, like questions to ask, and we may or may not be able to answer these today, but, okay. Yeah. Oh, and this question is, I heard that grad students are not covered by OSHA. Is that true? Y

[00:44:53] **Leah McEwan:** Yeah. So I think I've mentioned this when I was speaking to the last question that you asked me, Sarah, this is Leah.

[00:44:59]You know, that it depends on a lot of, it's one of those, it depends things. It depends on a lot of factors, and it could vary by institution and it could vary about what the position the student was in, at the time. Were they an employee? Were they a student? So that's not, it's a very gray area.

[00:45:15]And I think that's been part of the confusion of trying to figure out responsibility around, you know, taking active measures to be safe. And so I think part of the compelling a message here that we're, we were trying to deliver also by focusing in on publication is that that's often a process that's provided at least by the principal investigator in a research lab and, you know, and, and they can be demonstrating with their students the best practice, regardless of whether that student's covered by OSHA lab standard or not. So, no. And also, you know, again, you know, everybody can communicate that you want to communicate.

[00:45:56] You're wanting to contribute to the scientific literature. So the more you can think about how incorporating a safety into those, communications, you know, the more engaged the community becomes.

[00:46:08] **Sammy Segmann:** But in addition to just the, whether or not they're covered by OSHA, they may or may not be covered by workers' comp.

[00:46:13] And so, they, graduate students should really be thinking about this as they're working in lab. You know, what exactly is their responsibility for these types of things. Again, students in, in a, progressive type environment are held to the same accountability as employees in my opinion. Yeah.

[00:46:37] **Sara Tenney:** Okay. Here's another question around that, which, as I think of this is an interesting question, which is, if the hazard is incompletely described in a publication, can the author be sued or held legally responsible?

[00:46:51] **Sammy Segmann:** I have no, way to know what to answer for this cause it's outside the realm of my, expertise.

[00:46:59] **Leah McEwan:** So when you say, yeah, I mean, I guess I would, we would want to think a little bit more about what incomplete means in that situation. How was it phrased again, Sara, in the question?

[00:47:10] **Sara Tenney:** Mmm. If a hazard is incomplete in a publication, can the author be sued?

[00:47:16] **Leah McEwan:** Oh, right. Yeah. well that's, you know, I think that's something the community's going to want to think about. You know, with this, but, you know, incomplete. That's a, that's another very great area. You know, it, at this point, there's very little information that's included.

[00:47:30]There are a lot of, resources available for that you can reference to, you know, support your rationale for what you're putting in your statement. So the GHS symbols, you know, that are provided for most compounds, you know, will are an indicator, right? Information about how you're handling those compounds are good indicators as well.

[00:47:51]You know, again, to me, they were already incomplete.

[00:47:57] **Sammy Segmann:** Mike, I would look back on the question and say, would it be better that there was nothing there as opposed to an incomplete statement?

[00:48:05] **Leah McEwan:** This is that this is the situation that we've been in for a long time. And again, you know, if you feel most comfortable by at least using, you know, those, you know, those symbols, You know, those are United nations and OSHA supported communication standards, those symbols. So, you know, I think in that case, you know, that's a good place to start.

[00:48:25] **Sara Tenney:** All right, well, thank you, Sammy. Thank you, Leah. I think we're done with the question and answer section of the presentation. I'll hand this back to Mike.

[00:48:37] **Michael David:** All right, so before we wrap up, today, just wanted to ask if any of you had any final thoughts you'd like to share. Sammy, should we start with you?

[00:48:44] **Sammy Segmann:** Sure. so I did actually have a final thought. Performing a hazard analysis or in risk assessment allows the safety to become part of the research.

[00:48:54] And I believe, Leah alluded to this, experimental hazards and their associated risks will be organized for communication to future lab workers in that particular lab and for downstream users of the science. Teaching competencies to students will promulgate the, the knowledge forward and we can train students to think like a chemist.

[00:49:20] **Sara Tenney:** Yeah. Very inspiring. Sammy

[00:49:23] **Sammy Segmann:** I had to write that down.

[00:49:26] **Michael David:** Leah, would you like to say any final thoughts?

[00:49:28] **Leah McEwan:** Yeah, I'll just, I'll just, second what Sammy said, and then just add, you know, the process of documenting, thinking about how you would communicate. This just adds to the level of consideration that you're putting again, into your own experimental design, into your own process, making it more efficient, making it more comfortable, making it more safe if working with your colleagues in your lab, and then making that available to downstream, so it's a win win all around.

[00:49:54] **Michael David:** Thank you. And finally, Sara, do you have anything you'd like to share?

[00:49:59] **Sara Tenney:** Well, I'd just like to again, point to the ACS Guide, the chapter that Leah and Sammy wrote for that is outstanding, and I hope that you can benefit from that as well. Thank you.

[00:50:15] **Michael David:** Thank you for watching this presentation. ACS Webinars is provided as a service by the American Chemical Society as your professional source for live weekly discussions and presentations that connect you with subject matter experts and global thought leaders concerning today's relevant professional issues in the chemical sciences, management and business.