

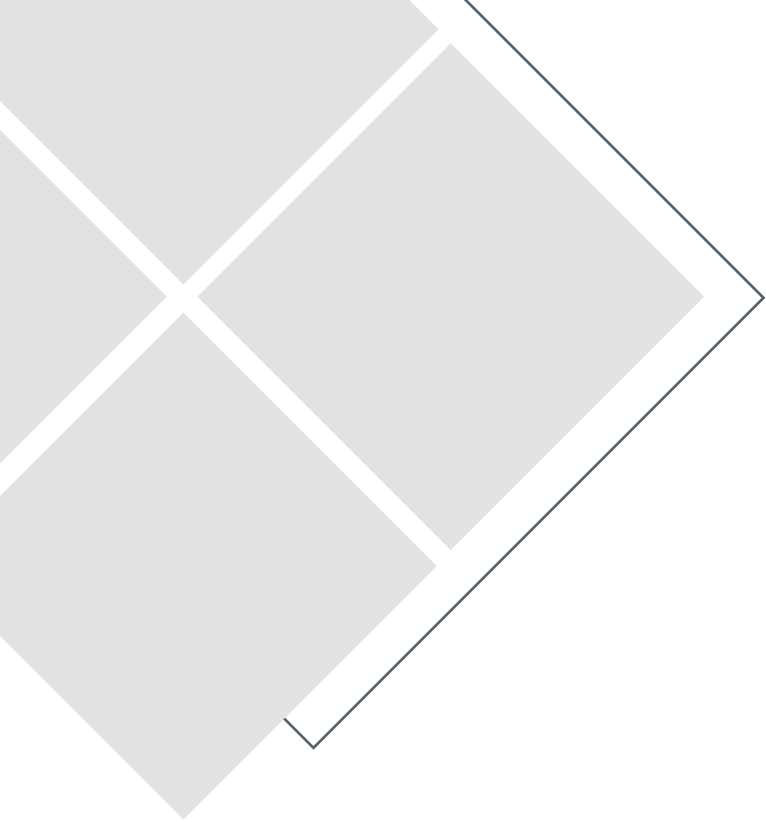
PUBLISHED BY

**SAFETY  
PARTNERS**

*Hands-on Workplace Safety*

# Incidents, Accidents, and Near Misses in Laboratory Research

VOLUME 8



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2023 - VOLUME 8

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**SAFETY**   
**PARTNERS**  
*Hands-on Workplace Safety*

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**Respectfulness:** We are all unique and we all add value.

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**Constructive Honesty:** Mentoring and supporting our colleagues and clients; knowing it is ok to suffer setbacks, provided you learn from them.

*Dear Partners,*

*It is with great pleasure and excitement that I announce the launch of the 8th edition of our unique publication, "Incidents, Accidents, and Near Misses in Laboratory Research." As a valued member of our community, we are thrilled to share with you the latest insights, experiences, and lessons learned in the realm of safety and risk management in laboratory settings. From my own experiences working in the lab, these shared experiences with laboratory incidents was a powerful teacher. We continue to be committed to learning through storytelling and I'm optimistic that this edition will not disappoint.*

*Over the past seven editions, "Incidents, Accidents, and Near Misses in Laboratory Research" has evolved into a mainstay for professionals and enthusiasts alike, serving as a repository of real-world incidents, their analyses, and the invaluable lessons derived from them – all with the storytelling aspect that enhances the experience. This edition builds upon that foundation, promising an even more enriching and insightful dive into the intricacies of safety through many examples.*

*Thank you for all the support over the years and enjoy!*

*Best regards,*



A handwritten signature in black ink that reads "Jennifer Reilly". The script is fluid and cursive.

**Jennifer Reilly**  
President & COO

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# INTRODUCTION

We're often told that occupational safety starts with the individual. While this is undoubtedly true to an extent, ensuring safety in the workplace is a team endeavor. Everyone, from the worker to the CEO, is impacted by laboratory safety, and it's everyone's responsibility. A weak link breaks the chain, and in the case of industrial safety, that can have disastrous consequences. People can get hurt, equipment can get damaged, and share prices can plummet when there's an accident onsite. Therefore, a healthy and attentive safety culture with robust safeguards is critical for the bottom line and, most importantly, the health and well-being of workers.

This year's publication features several incidents, near misses, and costly headaches. These events, sometimes harrowing, can shed light on bad practices that are easy to fall into, but have serious ramifications. More importantly, however, it features the successful efforts of dedicated individuals and teams to make their worksite a safer place. By learning more about these people's stories and unique perspectives, you and your team can implement positive changes to make your workplace safer for everyone.





## A 10-STORY HEADACHE

In the early 2010s, I worked with a company that served the greater Boston area. There's a large research community out there, with many established research centers that have been operating for decades. One of the buildings we serviced had it all — academic research labs, hospital departments, housing, you name it, all in one aging 10-story building.

On the very top floor, there was a research lab. A research associate named Allison was working one morning in one of the fume hoods. These fume hoods matched the building, functional but getting on in years. Now, inside fume hoods, you often find some shelving to keep the chemicals you use regularly in one place. Unfortunately, the shelving was also pretty old and had some glaring structural issues. There are little metal brackets that hold the individual shelves into the unit. This model had an issue where those brackets would get loose and wouldn't just snap back into place like the newer ones.

The shelving unit in the fume hood Allison was working in had another problem; one of the brackets was missing. The shelf without the bracket was held in place, but just barely. It was unstable to the point that you practically could look at it the wrong way, and the shelf would pop out. As a result, it sat in place by resting on top of the bottles on the shelf below it.

In the middle of an experiment, Allison pulls one of those bottles out. As you might expect, the loose shelf pops out, bringing three 2.5 L bottles of concentrated acetic acid and hydrochloric acid with it. The glass bottles bounce straight out of the fume hood and shatter on the lab floor, splashing Allison with concentrated acid up to her lower calf. Luckily, the lab was designed with a safety shower less than 15 feet away. Allison rushed to the shower immediately, ripped off her leather boots, and washed herself off.

Now, the thing about these safety showers is that they dump a lot of water in a short amount of time, a minimum of 20 gallons per minute. You want this kind of flow to save someone from nasty burns, but it also puts a lot of water on the floor. This lab, like many others, did not have any drains, so it pooled up. As the floor began to flood, the water mixed with the concentrated acid, creating a massive puddle of diluted but still very acidic water. Allison did what she was supposed to do and threw down absorbent materials from an acid spill kit, but remember that you're supposed to stay under the shower for at least 15 minutes. At 20 gallons per minute, we're talking about at least 300 gallons of acid water covering the floor of the entire lab and half of the hallway outside of it.

That's a considerable amount of water, and it began to eat away at the floor wax and seep between the tiles into the floor below. As we were on our way to the scene, we got a call from the lab directly underneath Allison's lab. Something is dripping from the ceiling. Then another call from the lab under them. Acid is leaking into their lab too. By the end of the day, the acid had dripped through 3 or 4 floors of labs.

As we began to appreciate the scale of the mess, we went ahead and called the Boston Fire Department, which has a well-equipped hazardous materials response crew. What started as 3 floors of evacuations ended up with the entire building cleared out. All 10 floors of it, labs, hospital rooms, and resident housing. When we made it to the scene from across town, the fire marshal had blocked everything off, not just the building but the entire block. We couldn't get in for hours, as they had to do mandatory on-site training and run through their procedures before we could start our work. It probably didn't help that about 6 firefighters got stuck in one of the elevators on the way up. This happened mid-morning, and we didn't make it to the scene of the flood until at least 4 PM. The scale of the mess was staggering. I don't think any of us left before 10 o'clock that night.

*The spill was the largest one I'd ever seen  
in my career, and I'm nearly certain it still  
is, and I've seen my fair share of incidents.*

We ended up having to rip the tiles out of those labs, replacing all of them on the 10th floor. After that, we had to go through the ceiling of each floor and make sure they were completely drained. The last thing we wanted was for one of the HVAC technicians to get a face full of acid while doing maintenance. Allison's boots were another unfortunate casualty, which probably stung, considering they cost about \$300. Still, it didn't sting as much as putting one's feet into acid-saturated leather.

Afterward, we decided to inspect the building to see how many fume hoods had those shelves with the unsafe brackets. Keep in mind that we're talking about 10 floors of labs, so we had to inspect upward of 150 fume hoods. The majority of them had the faulty shelving. Of course, we went ahead and replaced all of them, which took some time because we had to clear out each fume hood before we could swap them out. It ended up taking over 3 months to get the job done. Word spread around the research community, and most of the facilities did their own inspections, many finding the same shelving. As a result, many fume hoods ended up with new brackets, and a lot of labs kept their floors dry and uncorroded.

Most importantly, no one got hurt. Allison made it to the shower in time and ended up refusing medical treatment. Fortunately, the evacuation was so swift that none of the acid dripped on anyone. Ever since then, one of the first things I do when inspecting fume hoods is check the shelving. You'd be shocked by how often I run into bad shelving; an ounce of prevention saves several hundred gallons of acid from drenching the floor. Another lesson I took from the incident is that the moment you notice something unsafe, you need to bring it to someone's attention. Allison and her colleagues were so used to the setup that it didn't even cross their minds, but sometimes getting used to an inconvenience makes you blind to the dangers around you.

# THE ALARMS THAT CRIED WOLF... SORT OF

For several years, I worked with a property manager at an older warehouse built in the mid-1960s. It housed a hodgepodge of tenants, ranging from a frozen food manufacturer to an appliance distributor. That also meant that the types of safety events that occurred were equally varied. You see, the previous landlord wasn't much for procedure. Everyone there did what they wanted. Their lease agreements were sparse, some only about a page long. Lots of process and equipment implementation was formalized with only a handshake, hardly the way a warehouse with plenty of safety hazards should be run. And oh, were there safety hazards!

Shortly after my company purchased the facility, we had an incident involving industrial batteries. There was an old battery box in one of the areas that had been there since the '70s, older than most of the employees. It was suspended over the ground about 25 feet up. One day, I got a call that the thing was on fire. When I arrived, half the crew was staring at this smoldering battery. We got it changed out and did a sitewide inspection. There was one of these ticking timebombs in half the main rooms of the warehouse. Needless to say, we changed those out post-haste.

That wasn't the only issue with the batteries we had. One time, a forklift driver in one of the refrigerated areas was hooking up the forklift battery to the charger when it exploded in his face. Luckily, none of the acid got on his face, which was extra fortunate, as he wasn't wearing any eye or face protection, and the eyewash station was completely frozen over. Upon inspection, there was a nick in the wire and exposed copper. We did another sitewide inspection and found several batteries with this kind of damage. We had to replace them all, as exposed copper on a battery is a hazard waiting to happen. Afterward, we implemented new training to instruct workers to get help immediately when they find exposed copper wire on batteries. It's important we did that, as we later found out the fire suppression system was also frozen solid, causing us to spend almost \$60,000 on replacing all the busted pipes.

*Exposed copper on a battery is a hazard waiting to happen. Afterward, we implemented new training to instruct workers to get help immediately when they find exposed copper wire on batteries.*

As we soon learned, this was a good investment, as we needed to put out several fires in the coming years. Someone once threw a smoldering cigarette down the trash hopper, which sparked a pretty nasty fire. The thing ended up melting the loading dock doors, costing almost \$30,000. Needless to say, my company was not very happy about it. They were even less happy the next two times the hopper caught on fire the same way. We managed to nip that in the bud with safety training and some disciplinary actions. No one got fired, but it scared some sense into them.

Some of the things that the tenants would do would leave me flummoxed. One time, I got to work and noticed this pungent chemical smell emanating from the site of an appliance distributor. As part of their process, they produced a Styrofoam waste, and one of the managers decided it was a good idea to melt this down — without ventilation. This gave off noxious fumes, leaving the employees masking up with whatever they could find. This was yet another fire hazard, as condensed Styrofoam is super flammable, and they had pallets of the stuff just chilling beside piles of cardboard boxes.

I got on their case about it, as they never told us they were implementing a new process. Their management was obstinate and told us they would keep doing it. It made them extra upset when we called the fire department, who padlocked their equipment. We told them they had to install ventilation if they wanted to continue to melt down the Styrofoam. They decided that was too costly, so they just stopped melting it down.

The most memorable event for me happened a bit later. One of our tenants used ammonia for one of their processes. They had a

monitoring system that was prone to false alarms, so they eventually grew numb to the sound of them. One time, one of the employees contacted me because an ammonia alarm kept going off repeatedly. I got there, and I could smell the leak. This was the real deal, not a false alarm. I reached out to the technician on call, and he was in Maine for the weekend. He said he could return, but it would take a few hours. We didn't have that kind of time. Residential buildings surrounded this building on all sides, and we couldn't let that get out.

I made the executive decision to go into the room with the shutoff valve, which was saturated in ammonia. I told the employee who called me to come and check on me if I took longer than 10 minutes, as I knew the risks. Luckily, I was able to shut the valve off and get the situation under control quickly and safely. I know I wasn't qualified to do so — still, my actions kept several families from having to evacuate their homes, but in hindsight, I know I shouldn't have entered that environment.

Afterward, we did sitewide training to instruct employees not to ignore any alarms, no matter how frivolous they seemed. Had a less diligent employee been working that night, we would've had a much bigger mess on our hands. We also did inspections of everyone's monitoring systems. It was costly but worth it. It goes to show that safety requires that everyone be on top of their game and not ignore anything that could pose a hazard. With a lot of work, we managed to turn the safety culture around and haven't had a serious incident since.



# KNOWING YOUR TEAM

A couple of weeks ago, I got an email about an onsite incident. An employee named Dave was working second shift with a pallet jack. The thing jackknifed at a 90-degree angle, yanking his thumb in the process and sending him careening into another employee. Dave is a long-time employee who is a pleasure to work with and serves on the safety committee. Luckily for everyone involved, Dave wasn't moving chemicals or heavy cargo that could've hurt himself or his coworker. According to the email, Dave was going to see his personal doctor later that week, although he was a bit worried about his personal insurance.

This struck me as odd, as our procedure for on-site injuries is to either send them to occupational health or urgent care

immediately. I quickly emailed Dave to check on him and hear his side of the event. Apparently, he'd been moving a stack of pallets while trying to avoid the wood and cardboard debris scattered around him on the floor. In the process, he stumbled and yanked the handle the wrong way.

Dave is an enthusiastic guy with tons of energy and can sometimes get ahead of himself, so trying to power through a job without ensuring everything is out of the way is not uncharacteristic. Apparently, after the incident, he went to the safety officer onsite, who told him it would be okay to go to a doctor later, as he wanted to get back to work and finish the task. The other guy involved also turned down medical attention, saying he just got bumped and that it was no big deal.



It may not have been a big deal for them, but it was to me. We have procedures in place for a reason. An injury may seem minor on the surface, but delaying medical attention can easily turn a minor issue into something major. This was especially true, considering it was his hand that was injured. Had he damaged his thumb, it could've become a lifelong issue for him and require extensive physical therapy. The next time I saw him, I pressed him about what happened. It turns out the situation was worse than I thought. Even though there were ice packs in the first aid station nearby, he didn't put an ice pack on until after he got home that evening. That's an entire day without any medical attention. I asked him about the appointment he'd scheduled, and he said he was worried they wouldn't take workers' compensation and that his copay could be high. I was disheartened by this, as his physical well-being should've taken top priority, not the task at hand or money. I had a long talk with the safety officer onsite at the time. From then on, we made a point of getting employees seen by someone immediately, whether the incident seemed like a big deal or not.

Later on, I reiterated to Dave that he really should make sure that he gets care the next time something happens. He reluctantly agreed, although he was a bit miffed that I had implied he might have another incident. I felt a little bad, but this wasn't the first time he'd had an incident rushing through something. One time a few years prior, he and a coworker were trying to get a crate open. He didn't have a crowbar around, but they found a hammer nearby after

searching. They both figured they'd save some time and tried to smash the box open.

A few hasty swings in, and the hammer slipped from his hand on the backstroke, flying backward and clipping his coworker on the shoulder. They laughed it off, but Dave knew he needed to report the incident regardless. Afterward, we implemented some changes requiring employees to wear gloves when handling hammers or crowbars so that they wouldn't accidentally pelt a coworker with a tool because their hand was slippery. Furthermore, we bought a bunch of crowbars and put them up around the site so that one would be within reach anywhere someone might need to open a crate.

You may wonder why Dave was on the safety committee if he was accident-prone. He had a great eye for safety when it came to others, but sometimes it was like he had blinders on when he was focused on something. He was a real go-getter, and he had a one-track mind when he wanted to get on to the next task. By building relationships with your team, you can help cover each other's weaknesses and understand how best to approach issues in the workplace. If I'd been gruff or dismissive, he may not have taken my concerns to heart, which could've caused a bigger problem later on. Moreover, had this not happened, I wouldn't have known that our team had gotten lax on medical care. Since then, we've implemented some changes that I think will keep everyone a bit safer in the future.

*He had a great eye for safety when it came to others, but sometimes it was like he had blinders on when he was focused on something.*



# THE DEVIL IS IN THE DETAILS

*It's a big no-no to work with human materials like plasma on the bench. He needed to be working in a biosafety cabinet in the cell culture room. I asked him why he wasn't, and he told me he was in a rush.*

Earlier this year, I got an email about an incident in the lab. A researcher named Marquis had been working in the lab and spilled plasma on himself the day before. The next day, he told his supervisor and checked in with our partnered hospital. Those were all the details that we had. The lab manager called to ask about it because she was confused too. I told her to go ahead and file a report and that I'd check in with Marquis to learn more.

When I met up with him, Marquis assured me it wasn't a big deal. I told him that we still needed to file a report and that the email we got was way too vague. With a sigh and an embarrassed look, he told me what went down. While doing an experiment on the lab bench, he was pushing human plasma through a syringe filter. This model had no locking feature and just snaps on the end. As he pushed, the pressure was too much, and the filter flew off. With nothing in the way, all the plasma in the syringe sprayed all over his lab coat and his face. He immediately went to the lab safety shower, cleaned his face, and went back to work.

That night he was talking to his spouse about his day. After telling them about his mishap, his partner, who is a nurse, got on his case. "You need to go get it checked on, it's probably nothing but it could be serious if it was contaminated. Also, you really need to file an incident report because EHS and lab safety need to know what happened." Marquis reluctantly agreed and checked in with the hospital the next day. They told him that no further action was needed but that it was good he dropped by. Afterward, he went to work and filed the report.

The first thing that struck me was that all of this context was absent from the report. The only thing I knew going into the meeting was that he'd been splashed with plasma. Without knowing what went down, there was no way we could assess the situation to see what changes needed to be made. In addition, it's a big no-no to work with human materials like plasma on the bench. He needed to be working in a biosafety cabinet in the cell culture room. I asked him why he wasn't, and he told me he was in a rush. I swear, that's the start of half of the incidents we have, and I would've never known had I not followed up.



We had another meeting the next week. This time, his supervisor, the lab manager, and HR were there. During this meeting, we discovered another crucial detail — he hadn't been wearing his safety glasses. When we asked him why, he said he hadn't really thought about it because everyone else was kind of lax about it. That, we all agreed, needed to be fixed. Afterward, the lab manager and his supervisor updated their SOPs to reiterate the need for proper eye protection and to work under the biosafety cabinet when working with human plasma samples. They also included this information in the new hire training program to help prevent incidents going forward.

Had I not checked in with Marquis and just went with the incident report as is, none of these changes would've been made. We would've kept operating as usual until another incident happened. Considering all the different kinds of biological materials the researchers work with, the next incident could've been much more serious. As a result, we also revamped our incident report forms to encourage people to report everything they can remember about an incident. It may be a pain to recount every detail, but sometimes the minor details make all the difference.





# NEAR HIT OR MISS?

In my role as a safety manager, I received an email from someone in the lab a few months ago. They said there was a “near miss” in the lab. Earlier that day, a researcher named Lacey returned from a weeklong vacation and was tidying up her workspace for an experiment and saw an unlabeled flask. Assuming it was an old sample, she poured some bleach into it, intending to clean it out afterward. The liquid in the flask began foaming almost immediately. Lacey panicked and called out to her coworker. The coworker rushed over, grabbed the flask, dashed to the fume hood, and hastily put it in. They reported the incident to their manager and called in the waste vendor.

I called Lacey’s manager and asked, “Did Lacey go to occupational health or the emergency department?” “No,” the manager told me, “she spoke to the waste vendor, and he said she was okay, so she didn’t get seen.” I was flabbergasted. I had to put my phone down for a few seconds out of frustration. “This was absolutely not a near miss, and she needs medical attention now.” The manager sighed in frustration and told me that it wasn’t a big deal, she’s okay. I told him, “We don’t know whether she is okay, we don’t know what was in that flask, and more likely than not, she inhaled whatever was being produced in that reaction.” I argued back and forth with the manager for a bit, and he eventually relented. Lacey checked in with occupational health and was given a clean bill of health, thankfully. In the aftermath, I realized that the other employee wasn’t included in the report, despite likely having more exposure to the chemical than Lacey as he rushed it to the hood. He ended up getting checked out and was fortunately okay as well.

In the aftermath, we realized there was a high probability that the fluid in the flask was from a buffer kit containing guanidine thiocyanate and guanidine hydrochloride. When that reacts with bleach, it releases some really nasty off-gasses, like chloramines, chlorine gas, and even cyanide. This was anything but a near miss. If it really was the buffer kit, they inhaled at least a small amount of toxic gas. I had a long talk with the manager, and they sent out a strongly worded email to all the employees, highlighting the need to label everything and to be extra careful with the buffer kits. The lab was moving soon, so they made a point of emphasizing it in the training materials.

The researcher’s reluctance to go to occupational health stuck with me. All it took was reassurance from one professional, and the realization they put themselves in danger, likely out of embarrassment and fear of reprisal. That’s the thing that gets me. Your health is more important than your pride, and you won’t get in trouble because occupational health reports an incident — the report won’t even have your name on it.

*We don’t know whether she is okay, we don’t know what was in that flask, and more likely than not, she inhaled whatever was being produced in that reaction.*

# GOING VIRAL

In the fall of 2021, a researcher named JJ worked in a research lab that studied viral vectors for cancer therapies. She'd just finished encapsulating a modified viral agent genome into a phospholipid nanoparticle. It had been engineered to selectively enter cancer cells, replicate inside them, and kill them. Meanwhile, the unmodified virus it was based on is transmitted via respiratory droplets. JJ was in a rush; the lab she was preparing the viral agent for was waiting on her, and she was a bit behind schedule. The next step was filtration, which wouldn't take too long if she just got it started quickly.

JJ had completed a trial filtration the week before, so a filter was already in place. She was supposed to use a new one each time, but this was at the height of the pandemic and supply chains were strained, and the filters were on backorder. She'd only filtered a small sample, so why replace it? The filtration starts fine, but she notices the pressure gauge won't stop climbing. Thinking fast, she reaches over the filter to turn off the pump. As she's leaning over it, the filter pops out, splashing her in the face. The solution drips behind her glasses and down into her eyes.

Thinking fast, she rushes to the eyewash station and flushes out her eyes. She then changes her PPE and returns to work, this time with a new filter. One of the women from lab safety drops by and notices the still dripping eye rinse faucets. She tells JJ that she needs to fill out an incident report. JJ finishes the filtration, files her report, and goes home. JJ returns to work the next day, but by Friday, her eyes are irritated, and she has a scratchy throat.

Her manager calls lab safety, who gets in touch with EHS. EHS then calls JJ, who informs them she is immunocompromised. She's instructed to go to the ER, where she is tested by PCR to confirm the virus's identity and ensure she doesn't have COVID. She's told to stay home for at least 3 days.

This was a huge mess and an OSHA-recordable incident. Since she got sick, the Institutional Biosafety Committee (IBC) had to be informed, followed by the local board of health as per the lab's rDNA permit and a local biosafety ordinance. After an internal investigation, her lab implemented process improvements and new safety protocols. Luckily, JJ was fine, and no one else got sick. Still, it was quite the time to have an accident with a viral agent, especially given the atmosphere at the time.

*She was supposed to use a new one (filter) each time, but this was at the height of the pandemic and supply chains were strained, and the filters were on backorder.*





# A PROCEDURE GONE AWRY

Kelly was a new researcher at a small research facility with a tight-knit crew of biologists. Everyone knew everyone. It was her first time doing a tail vein injection on mice, and she had a senior researcher there to show her the ropes. That day, she was going to be injecting a radioactive tracer for an experiment. Despite being small, they had a well-equipped animal care facility (ACF) with a dedicated procedure room. Both Kelly and her labmate were decked out with PPE — safety glasses, bonnet, lab coat, face mask, and shoe covers — that included everything you could want for what they were doing.

Although she was nervous, inserting the needle went smoothly. It was when they went to retract it that things went awry. As she pulled the needle out, some liquid from the syringe splashed out. It was only a few drops, but they managed to land everywhere her PPE didn't cover. Droplets flew between the gaps of her safety glasses onto her neck and nose, rolling back behind her mask. The procedure room had no sink or eyewash station, so her coworker guided her to the closest eyewash station. She insisted that she didn't want to splash the radiation everywhere or spread it over more of her body, so instead, she blotted the affected areas and used a sink to wash everything off afterward. She then quickly removed the rest of her PPE and had her

labmate go find her a new set. They called radiation safety, and she quickly went to occupational health. Since the splash was small, they had her go home and immediately take a shower.

When I spoke to the emergency coordinator about it last week, she looked confused. "What incident?", she said quizzically. It turns out that Kelly and her coworker only told the radiation safety officer. The emergency coordinator was rightfully upset and guessed they'd done that because they were afraid about confidentiality. It makes sense because Kelly was new, and the site was so small that everyone would've figured out what happened. Still, there's a procedure for a reason, and her well-being was more important than everyone finding out she made a mistake.

Afterward, they made sure that everyone knew to reach out to the emergency coordinator if anything went wrong. Furthermore, they added a face shield to the list of PPE for tail vein injections and ensured that new trainees did a dry run with saline before injecting any reagents. The ACF manager also considered installing an eyewash station in the room, but that's still in the works. Regardless, the new changes were for the better, and no one gave Kelly a hard time.

*As she pulled the needle out, some liquid from the syringe splashed out. It was only a few drops, but they managed to land everywhere her PPE didn't cover. Droplets flew between the gaps of her safety glasses onto her neck and nose, rolling back behind her mask.*



# NOTES



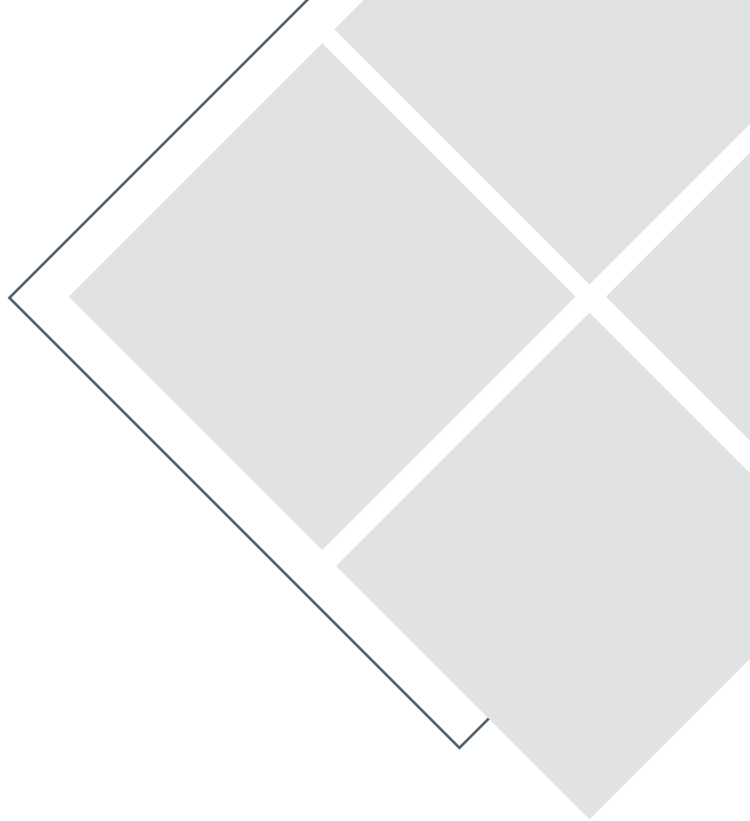


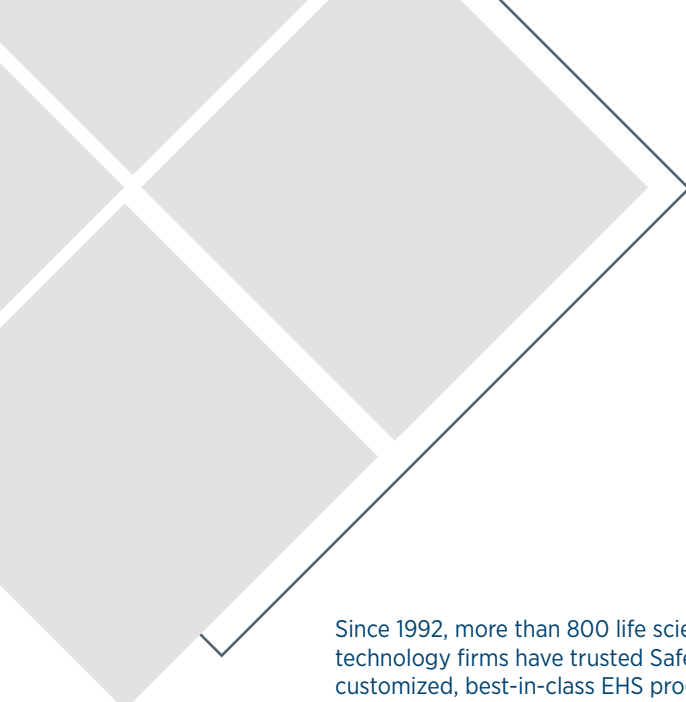
# NOTES



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