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## **Disaster Preparedness and Response**

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### **Slide 1: Title Slide**

>>*Megan Clark*: Good afternoon. I am Megan Clark, part of the NIH Office of Laboratory Animal Welfare. Today is September 26th, 2024, and I'm pleased to welcome you and our speaker to our webinar today on Disaster Preparedness and Response. In case you weren't aware, it's National Emergency Preparedness Month, so we're very excited for this opportunity.

### **Slide 2: Housekeeping Details**

There are just a few housekeeping details before we get started. This session is being recorded. Your participation indicates your consent to recording. The slides, transcript and webinar recording will be available after the webinar on our website. They need to be processed for 508 compliance compatibility before posting. This can take a few weeks, so please bear with us.

Please note that OLAW is unable to offer a RACE or CPIA credit for webinars at this time. Attendees are encouraged to check with their individual licensing boards or accrediting associations for information about continuing education credit.

Although the content of this webinar is directed to those involved in the care, use, and regulation of animals in research, registration is available to all interested members of the public. Therefore, please exercise discretion when sharing sensitive content and material, as confidentiality cannot be guaranteed.

### **Slide 3: Q&A and Code of Conduct**

If you have questions throughout the webinar, please enter them in the Q&A box. The Q&A box does allow questions to be submitted anonymously. The chat will also be enabled for this webinar. We will be taking questions at the end of the webinar, but if we run out of time, or if the question is a little more nuanced or context-specific, we will send that question to our presenters and we will append the answer to the end of the

transcript. We'll monitor the chat as best we can, and we encourage you to use it to interact with us and the other participants. If you would like, you can also enable subtitles by clicking on the CC icon usually on the bottom of your screen in Zoom.

Participants are subject to the OLAW Code of Conduct found on our website. To read the Code of Conduct, please click on the link provided in the chat, and please do note that violations may result in removal from the session.

As a quick note, we also encourage you to visit the new [Disaster Preparedness and Response](#) webpage on the OLAW website for additional information and resources after the webinar.

#### **Slide 4: Speaker**

And now I would like to introduce our speaker, Dr. Mike Holbrook. Let me go back - technical difficulties. Alright. Dr. Holbrook is the Associate Director for High Containment at the National Institute for Allergy and Infectious Diseases Integrated Research Facility at Fort Detrick in Frederick, Maryland. He is the current chair of the NIH High Containment Task Force, as well as has been involved in the development and activation of three BSL-4 facilities. Prior to his current position, he was the Director of the Robert E. Shope BSL-4 Laboratory at the University of Texas Medical Branch and the Emerging and High-Risk Pathogens (BSL-4) Core of the Galveston National Laboratory, in addition to running his own research program, focused on emerging and re-emerging viral diseases. While there, a key consideration was the annual threat of hurricanes that could impact the barrier island, which has an average elevation of seven feet above sea level. During this time, hurricanes Katrina and Rita came close to the island, and Hurricane Ike made a direct hit. Disaster planning and preparedness played a critical role in the ability to reduce storm impact.

Now I would like to turn it over to Dr. Holbrook.

>>Dr. Michael Holbrook: Great. Thanks, Megan. If you could let me share--?

>>Megan Clark: All right, you should be able to.

>>Dr. Michael Holbrook: [Pause] You can see?

>>Megan Clark: Yes, and I will turn off my video for bandwidth.

#### **Slide 5: Disaster preparedness and management in high containment laboratories**

>>Dr. Michael Holbrook: All right, we should be in the proper mode. So thank you, everybody, for attending the seminar today. This is a topic that is something that I think about quite a lot, even though I'm in Maryland and not on Galveston Island anymore. And of course, if anybody has been paying attention to the weather in the past few days, if you're in the Florida panhandle or West Coast of Florida, you're having a rather rainy day. So a little bit timely as far as this presentation goes, I think.

#### **Slide 6: Disclaimer**

So first and foremost, all of the opinions presented here are mine. They do not represent those of my-- NIAID or the Health and Human Services Department, or anybody else in the U.S. government. Any names of commercial products or organizations do not imply endorsement by the government.

## **Slide 7: Objectives**

So the focus today... there are several different objectives that I'm going to kind of cover. Initially, I'll talk a little bit about the overall objectives of disaster planning for biocontainment facilities, and why that's important, and how you go about doing that. Then I'll give you some examples of risk mitigation strategies, once you've identified potential things to plan for. Then we'll talk about some lessons learned and how you can use that to reformulate your risk planning strategy sort of on-the-go. And then I'll go through a couple of real life situations that Megan alluded to from my time in Galveston, where we actually got to test very directly our disaster planning processes.

## **Slide 8: Disaster planning and biocontainment facilities (1)**

First off, one thing to think about when you're planning for disasters in specific biocontainment facilities is, one of the important things is to think about external stakeholders. Obviously you're thinking about yourself and your facility and your staff, and so on, but you also have to keep in mind the people outside of your institution and facility that might have an opinion about what it is you're doing. Biosecurity regulators are one group of people. For those of us who work with select agents, this is the Division of Select Agent and Toxins at CDC, and they're really, really interested in making sure whatever agents you have in the lab are secured and they stay in the facility in case something happens. They're also indirectly interested in the animals and the management of animals in that facility, but really, they don't care all that much about that.

On the other side, as you guys are pretty familiar with, I assume, is the animal welfare people who have pretty much the exact opposite opinion. They really are focused and interested on the management and the care of the animals, and particularly if you have to deal with potential euthanasia of large numbers of animals and how that might impact your animal processes and protocols. Then they're typically a whole lot less concerned about what agents you have in the place, assuming the animals you have are not necessarily infected with them.

## **Slide 9: Disaster planning and biocontainment facilities (2)**

So disaster planning for biocontainment facilities, by necessity, it has to fall within the scope of whatever institutional disaster planning you have. So if you're at a university, obviously the university should have some level of disaster planning. I have discovered that the one place that probably doesn't need that is the University of New Mexico in Albuquerque, because apparently they don't have things like natural disasters, but they are close to a military base, and so they could eventually have something to worry about in the event that somebody takes an interest in that particular facility. But usually you have to really focus with how your lab fits within the institution.

But specific considerations to think about, and also it is important to make sure that your institution understands, because sometimes they forget that biocontainment labs are there when they're doing their full institution planning. But special considerations include the agents you have and how these need to be stored and secured, and then how you deal with things like power loss in the event you have all your stuff stored in freezers, because obviously if you lose power, freezers don't work so well. If you lose your backup power, assuming you have it, freezers still won't work very well. So that's an important thing to keep in mind. Most of us, and I'm a virologist by training and the agents are really a particularly important thing (because some of these things, once you have them, they're really, really hard to get again). So you want to keep good care of those.

Animals-- any animals in a biocontainment lab will require care and support if you continue your study. So if you have something that's a sort of a small-scale event that happens that could impact your facility, are you still able to access the space? Are you still able to take care of the animals? Who is going to do it? Do you need to euthanize the animals, and what's the situation in which that sort of decision has to be made? So all these things have to be considered ahead of time and put into your disaster planning process. Then, if you do have to euthanize a bunch of animals, what do you do with the carcasses? If you don't have power, you don't have steam; autoclaves don't work so great. If you happen to have a tissue digester, those things don't work very well either without power. So if your freezers don't work, then obviously you have an even bigger problem, most likely. So these are sorts of things that you have to keep in mind in setting up your plan.

Your infrastructure-- depending on what happens, will you have your air conditioning system working? Can you control humidity and temperature? Obviously if you have animals in the space, you have to maintain certain temperatures and humidity levels, based on the guidelines. Will there be water available? Is this something that you-- if you have an automatic watering system, is it going to function? Is there going to be tap water available if you have to come to a backup? Then if you have to bring out cages or monkey racks or something like that, or if you're in a livestock facility, how do you deal with large amounts of waste material?

Then of course, security is really important. Certainly when it comes to the BSL-3 and BSL-4 labs-- is the facility secure, are the doors staying locked? If they don't, then how do you keep people out? And if you need to let people in, how do you go about doing that?

And then, of course, the staff, which is obviously a very important part of it. Will staff be able to access the campus in the buildings, depending on the certain scenarios? Are the basic needs for staff available? Will they be able to access food? Will they be able to access water? Is the waste management system working so they have bathrooms available, whether they're porta-potties or fixed restrooms, or something like that? Will that stuff be available? So these are all the kinds of things that you have to think about. And there's quite a few things, certainly from the institutional perspective that aren't considered very carefully when it comes to planning and the relationship with-- you know, research labs in general, but biocontainment labs in particular.

#### **Slide 10: Critical considerations**

So critical considerations-- some of these are going to be repetitive, like I just said before, to a certain degree. Agent and animal management, as we just kind of went through, is really important. But one of them is harder, and that's the animals. The agents, obviously, can go in the freezer and you can leave them there. But going back to the issues with the animals, how do you get through to them, how do you get water to them? How do you autoclave things, temperature and humidity controls? Power, in some cases, if you have your lab on a 3rd, 4th, 20th floor, how do you get stuff up and down? The elevators are sort of important when it comes to those things, because most people don't like carrying monkey racks up 10 floors of stairs. Carcass disposal, as I mentioned, freezer space, autoclaves and the tissue digester, I touched about. Then, of course, carcass management. So that's a little bit redundant with the previous slide, but it's also important stuff to keep in mind.

#### **Slide 11: Risk mitigation Step 1- Identifying Risks**

So risk mitigation-- Step 1 is identifying what your risks might be. So every different institution and every different location has a different set of risks based on their particular situation, whether it's their physical location on the Gulf Coast, or if you're in Winnipeg, for example, or if you're on-- I don't know where, maybe in the middle of Kansas where they like to have tornadoes occasionally. These are the sorts of things you have to

think about. So here we like to think about two different kinds of risks; risks that are predictable, and those that are unexpected. So, for example, some weather events are predictable. For example, the hurricane that's now banging upon Florida-- a week ago we didn't think it was going to show up, but we've certainly known about it for a few days. So you can kind of anticipate that. Then of course, it's still the middle of hurricane season, so anybody on the Gulf Coast or the East Coast of the United States should know that these things can happen. So we'll call that somewhat predictable. Snowstorms-- some blizzards can be predictable too, because you know they're coming. You're told about it, and so you can anticipate that.

Some are unexpected. For example, you can have a building automation system failure that you don't anticipate, like you're working in the lab just fine, and all of a sudden the computers all stop working, and then what do you do? So that's something that's like an unexpected failure. In our case, that would include something like a breathing air failure, breathing air compressors fail, or you have some other component of that system that fails. So these are the sort of things you don't expect, and can't really anticipate, and are a lot harder to plan for. Or not a lot harder, but they are harder to plan for sometimes.

And some risks we also consider either "dynamic" or "sporadic." So a dynamic is a risk that's ever-evolving, much like weather events would be. Like you don't always know where a hurricane's going to go, or you don't always know if a tornado is.... or a band of green clouds are coming across the plains-- you don't always know where that tornado is going to go, but you know some are coming. So those are the sort of things you think about. Sporadic events are things that we like to refer to here in the United States government as IT updates-- every once in a while the IT people like to push security updates, or various sort of things onto our computers, and then you show up the next day and they don't work. So these are things that happen with some frequency, but they're the same event more or less over and over, and so you have an easy way to solve that problem. Well, generally an easy way to solve the problem.

Then also when you think about risk, you also have to think about the potential impact. Some risks are fairly minor, like for example, if my computer here doesn't work, that's not that big a deal. But if the computer that runs the building automation system doesn't work, that's a much bigger problem. And so you have to think about that sort of thing. Whenever you think about the potential impact, you also have to think about the worst-case scenario. So for example, if our building automation system decides to fail, does that mean all the doors are going to open and everybody's going to run out of the lab and we're going to have an exposure to everything? Probably not, because that's not how things are set up. But that's the sort of stuff you want to think about. And how do you mitigate that risk in the likelihood that that's going to happen, because it's always better to plan for the worst-case scenario than not, because if you don't plan for the worst case, the worst case is absolutely going to happen. That's how that works. And you also need to think about where the weak links might be. So where are your highest likelihood points of failure? Is there something that is pretty obvious that if you don't address it, you know it's going to fail pretty much no matter what happens? So you need to really focus on those. As I said, you also need to assume if something could go wrong, that it's going to-- because again, if you don't make that assumption, then whatever you didn't plan for is exactly what's going to happen.

## **Slide 12: Major risks for high and maximum containment laboratories**

All right, I'll go through some major risks, at least from my perspective, for high and maximum containment laboratories. This isn't necessarily specific to these labs, but just sort of in general for pretty much anywhere, I would think. [Pause] And these are just things that popped into my mind, so you may have a little bit different list in your head, but I think this will cover most things. Weather [as] a natural disaster—and I think this is one of those things that most of us think about most. Certainly I do, I mean having spent 11 years on the Texas Gulf

Coast, and I grew up in central Oklahoma, and weather is something that we learned to pay attention to a lot. So you tend to plan for these things.

Infrastructure problems-- you need to think about equipment failures, as I mentioned, or power failures. And then this last summer, we were reminded about global problems when computer companies can't do their job properly, if you remember the CrowdStrike issue that happened in July where it shut down all the airlines around the world. These sorts of things you need to sort of...obviously you can't necessarily plan for that, but you need to have in your mind what would happen if something like that would happen. And is that a single point of failure for your institution like it was for many airlines? Or is it something that there is redundant features or a backup to help mitigate or reduce the risk?

People-- people are always the moving part in a lot of things. Risks can be disgruntled employees, or for the-- you guys are animal workers and so you're probably most familiar with animal rights protests. Those aren't nearly as big of an issue as they used to be, but they certainly exist, and they certainly are and can be a problem. So if there are protests in your area, how does that impact your ability to do work or your ability to do your job? Does it produce a risk for your staff, trying to get in the facilities and do their jobs?

Politics and funding-- I work for the government, and of course this is always something that is of interest. Right now, we're waiting for the president to sign the continuing resolution for next year's budget, so if he doesn't sign that, that causes a problem for us. We essentially have to shut down our facility to a large part, so we have to think about these things quite a lot, actually. Then, of course, everybody's been paying attention over the past few years, there's lots of political attacks on people who work (virologists in particular, and a lot of people who work on infectious diseases) because of all the COVID and stuff that's been going on. So these sorts of things we have to keep in mind, because you don't always know how that's going to impact your ability to do your job.

### **Slide 13: Weather**

So we'll kind of go through some of these examples. Weather, as I mentioned is one of those things that's kind of high on my list of things to worry about. It's probably, I think for most folks, the most recognized risk; it's certainly one of the most obvious risks, I think. Some examples: hurricanes-- research facilities on the Gulf and East Coast need to be prepared for hurricanes. That's fairly obvious right about now if you look at the weather down south. June the 1st to November 1st is, in theory I think, the tropical hurricane season, although that seems to be shifting to later in the year. As we're seeing right now, you have a big hurricane hitting Florida-- it's almost October, and that's a little bit late for that to be happening. So as the ocean gets warmer this is becoming a bigger problem. These storms also seem to be getting bigger, which is an issue. Although we think about hurricanes, we also need to keep in mind tropical storms. For those who have been around for a while, you might remember the tropical storm that flooded Houston about 23 years ago. Tropical Storm Allison essentially destroyed the BSL-2 vivarium in the basement of the Texas Medical Center because they had-- the water went in and there was no way to get it out. That induced that facility or that campus to put in some very significant flood mitigation systems to help prevent something like that from happening again. So tropical storms clearly can be a problem as well.

Tornadoes-- as I mentioned, I grew up in central Oklahoma, so I'm used to these things. Nowadays-- you know, back in the day it used to be you'd see the clouds coming so you'd go outside to look for the tornadoes. Nowadays the weather guys are pretty good about telling you exactly where it's going to land, and the timing for it. So you can plan a little bit better than you used to be able to, but nonetheless, these things are pretty big, and they can just sort of pop up pretty quickly, and you may not have a lot of warning or opportunity to get out of

the way. So these are things to worry about. Certainly if you happen to be working in Stillwater, Oklahoma, or Norman, or something like that, or North Texas somewhere, you can still tell this is a big problem.

Of course blizzards-- if you live in the northern part of the country, you guys know about these things. And while these aren't likely necessarily to damage properly-built facilities, they can certainly potentially impact infrastructure, like power, and they may also impact staffing needs (so folks can't get in to take care of the animals). There needs to be a plan to be able to manage that.

#### **Slide 14: Natural Disasters**

Natural disasters-- some of these things, particularly wildfires, seem to be a lot more of a problem. Certainly if you're in California or the mountain west, the risk of fire is quite high. Although the risk in the Great Plains, since there has been a lot of drought over the past number of years, that's also a big problem. Once these things get going, they are hard to stop. The picture on the right there is a fire earlier this year outside Boulder, Colorado, and you can see some buildings from the CU campus right there. That fire was fortunately contained, but there was one a few years ago, down the hill closer to Denver, that was a real problem for a lot of the communities down there. So these things can really take off and be a problem.

Earthquakes-- clearly, earthquakes are not exactly predictable, and folks who live on the West Coast are at particularly high risk. I think most of the facilities are reasonably well-constructed, but nonetheless, when you-- at some point in time we're going to get a great big earthquake out there, and when that happens I guess we'll have to see how that turns out. But these things are obviously a big problem. A lot of the buildings are designed for it, but even so, it could still be a risk.

Tsunamis-- this isn't something that we typically worry about much for a large part of the United States, but given some of the earthquake possibilities off the West Coast of the United States, there is potential concern for tsunamis along the West Coast. I think most of us probably remember the Fukushima tsunami in Japan a few years ago. They had planned for a set of circumstances, but the one they got was a bit more than they expected, and they ended up having some issues, to say the least.

#### **Slide 15: Not so natural disasters and other events**

Some not so natural disasters and other things to take into consideration when you're planning for potential risk mitigation strategies. Military activities-- right now I'm on Fort Detrick, which is a military base. We have three biocontainment labs that I can see from right outside my office window. So we have—we tend to think about potential catastrophic events a little bit differently. We have some important government and military facilities on this post, and of course Washington, DC is 30 miles down the road, and Camp David is 15 or 20 miles just up the hill here. And so we're sort of a target. We tend to think about potential military problems that could impact our ability to do work.

Protests-- as I mentioned previously, animal rights protests are probably not as big a problem as they were maybe in the '70s or '60s or something, but they're still a major problem and a risk to staff, because I think we all know that you never know when somebody might show up at your door and give you a hard time if they find out you work on animals. And while I don't know that it would necessarily directly impact a lot of facilities, it could definitely impact the staff.

Then of course, we all know how guns are in this country, and so you could have an active shooter pretty much anywhere in the United States, anytime. Every time you open the news every morning, it seems like there's a new one. We had an active shooter event on this post, about 200 yards from where I'm standing right now, outside of a Navy Research Lab. So these things can happen, and so you have to be aware of it. I think most of us probably have active shooter drills or at least active shooter training in our institutions that we have to do frequently.

#### **Slide 16: Potential impact areas that need to be considered**

So potential impacts that need to be considered when you're developing your risk mitigation strategies-- infrastructure. These can include a lot of things. I went through some of these earlier, but if you have a central utility plant, that's something that is a critical piece of infrastructure. That's what we use to operate; it provides our cold water, our steam, and our electricity. If any of these things go down, it can impact our operation, and certainly the welfare and care of our animals.

Loss of electricity and chilled water as I mentioned. Domestic water-- if you live somewhere that happens to have a hurricane, for example, a lot of times the water is turned off because of contamination from coliforms, or they don't want you to use the waste management systems or something like that. Loss of sewage management-- that's also a potential problem. I think that's one of those things that people don't think about. They think more about where the stuff comes from, rather than where it goes. And if you have your waste treatment plants are flooded or not operational, clearly your use of toilets and sinks and so on is not going to help them because that sewage is going to go somewhere. And if the system can't handle it, then it's going to be a problem.

Phone system failure-- nowadays, since we all rely on cell phones versus "Ma Bell," if our cell phone towers go down, that could be a problem. You may not be able to communicate, and you'll not be able to do a lot of things. I'll give you an example; I was in Europe this last week and was driving around in the northern part of Portugal, and they were having some wildfires... and we got to driving a little too closer to the fire than we probably should have. But the GPS went out. Phones went out. And then you kind of have no idea how to get around so much. So these are the sort of things in modern times that you need to think about. So if you lose your phone system, what's your backup plan? We have two analog lines in our building. And they don't-- I think one of them doesn't work very well, but that's it. And if you- and we don't; we do have radios here because we are on a military base, but if you're somewhere else, do you have radios that can communicate? Do you have sat phones that can communicate? These sorts of things need to be thought about, because communication is probably, if not the most critical aspect of disaster management, it is certainly really high on the list.

IT system failure-- is this a local problem [or] larger impact? If your local computer goes out, it's not going to have a big deal. But if the entire network that serves your region is down, that could be a real problem. And of course if you're working at a biocontainment lab, one of the most critical things to make sure you can do is retain the biocontainment barrier. And if you lose your BAS system, are you still able to do that? If you lose your security system, are you still able to do that? If that's a question, that you need to think about how you're best going to manage that potential concern, if it were to happen. And as I've mentioned several times, can staff access the space despite failures? And certainly if you have to manage animals, people have to get in, that's part of the deal. So you need to make sure you have a way to ensure that staff access is possible, if it is possible. Then another question of course, is, depending on the circumstance, can you continue with active work or must it be terminated? For some of us who have longer-term experiments, you don't always-- or very expensive experiments, like non-human primates, or agricultural species—you really...it's very expensive to terminate experiments. So a lot of PIs are going to give you pushback on whether or not you have to euthanize all their



animals, but if it's not going to be safe for people to work with the animals, or if it's not going to be good for the animals, or something along those lines, the need to terminate the experiment has to be considered.

Then of course other things to consider-- what other resources and staff and time do you need to return or to return to occupational capacity? That could be a little or a lot, depending on the situation. Also, are there external entities that can impact your ability to run through your risk mitigation processes or your recovery plans. For example, here, Fort Detrick is a U.S. military or U.S. Army installation. NIH is not the Army, but the Army has a lot of control over what we can do. They control whether we can get on post, they control whether or not we can get into our area here where our buildings are. So these sorts of things are important to take into consideration, particularly if you don't have the best landlord, or you don't have-- or if somebody else can control how you access space. For example, when I was in Texas, Galveston Island was closed for a period of time, so you had to convince the State Police that you needed to get on the island to do your work or to help with the recovery efforts.

### **Slide 17: Mitigating Risk (Planning)**

Mitigating Risk, the planning aspects-- once you've identified your risks, you really need to establish good plans on how best to reduce potential impact if whatever that event is actually occurs. So clearly, developing an emergency response plan is a critical aspect of that. That's sort of the fundamental part of risk planning, so that should be done not only at the institutional level, but you should also have your own emergency response plans independent of what the institution says. So that you say if this event happens and our BSL-4 lab has this, this is what we're going to do. Oftentimes your institution will want to review those plans to make sure it's consistent with their overall processes, and they should do [that], because that way they don't forget you exist. But you need to make sure you have your own that's focused on what you need to do in what your space is. Then of course you also need to make sure your staff are properly trained. This is a little bit hard to do in some ways, because you can drill a lot of scenarios, you can think about these things; active shooters, a mysterious package, or like you have an incident in the facility like a needlestick or something like this-- these things you can actually drill. But there are some things you can't. You don't always know if a tornado hits what's going to happen. So you have to kind of do tabletop exercises or come up with worst-case scenario sort of things, to make sure you have planned properly.

Then you also have to make sure that you include all relevant parties, even if they don't seem like they're important. There are lots of important people you might not think are important, but *they* certainly do. This not only includes the fire and the police and any government people, but there might be a government person three layers down who has a very specific job that they have to do that needs to be notified. So you need to make sure you have a list of who all these people are, and to make sure that they're notified, or they're a part of the conversation. And importantly, certainly here and certainly, I think, in most institutions (especially if you're like academia) part of those people involved in the media office. You need to make sure you're engaged with them and you know who to communicate [with], because (you know, certainly in my experience) when these sorts of things happen... I was contacted to talk to the media, which wasn't my most favorite thing to do. But somebody has to do that, and somebody has to get news out so that you can mitigate the rumors or stop the rumors going around about different things that are happening. So keeping the media people involved is really important.

You also need to ensure that you have effective communication processes in place. You need to know the who and how you're going to communicate with these people, what their phone numbers are. And if their phone doesn't work, would they have a backup contact, and how do you get hold of them? Again, if cell phones don't work, do you have a means of contacting these people, whether it's direct or indirect, or whatever. But these sort of things have to be in place.

Then when an event happens, I can guarantee it will not go as you had planned. Something will be different, or something will impact your decision-making process. So you need to be able to adapt, and you need to know how you're going to do that—how you're going to adapt. Then as I think I've said a few times, you really need to anticipate that the worst-case scenario thing is going to happen. So how do you anticipate the unexpected, and what those unexpected things might be?

### **Slide 18: Risk Mitigation Planning Process**

Alright so the Risk Mitigation Planning Process-- as I mentioned, you need to identify the risks. You need to plan and document your risk strategies. And then it's important to drill the risk mitigation strategies as best you can. So for example, if you're going to have to do an emergency shutdown of your facility, how do you go about doing that? You don't have to actually necessarily do it, but you need to at least walk through the processes: "we're going to do this", or "we're going to use these cages," [or] "we're going to use this autoclave," [or] "we're going to put our waste here." If our autoclaves that don't work, we have this company that's going to come get it, and [on and on], and this sort of stuff. So that way, at least you have a good understanding of how it's going to work. Then if you're having to work with an outside party like a waste management company, they know what the process is, and they know what the drill is. So if they need to come in and do something, you guys have been through it, and you know what that's going to be.

Then if an event happens, then you have to implement the plan and go through it and see how it works. Whether you're doing drills or you're having to implement your plan due to an event happening, there's always going to be lessons learned, and then you have to go back and modify your plan. It says on here "when necessary," but it's always going to be necessary. These things are dynamic, and they're always going to change. So you need to be able to adapt, you need to be able to make modifications to your plan and be comfortable doing so. Because a lot of people say, "Well, that's just how it's going to be." That's not helpful. You need to be able to be open-minded, and to come up with a more efficient strategy. Then when you do your drills and implementation, obviously additional risks may become apparent.

### **Slide 19: Implementing risk mitigation plans**

So implementing risk mitigation strategies, or risk mitigation plans-- the first and most important thing is to begin your implementation as early as you possibly can. If you see, like for example in Galveston, we'd see a hurricane pop up a little bit on the east of, say, Puerto Rico or Cuba or something like that, we're all talking already. We're all planning. We're thinking now what we're going to do. Where is this thing going to go? The weather people will kind of tell you where it's going to go, but you still have to think about it. Then we start with the communication. You make sure all of the staff are involved. A lot of times you're going to have people out of the country, or on travel or something like this, so you would have to make sure you've identified their backup contacts and all this sort of stuff. If you have external partners, make sure you start your communication plans with them, and you've got that structure in place.

*[Video buffering]*

Talk to your external regulatory what's going on, and what your plans are, and of course the media relations people-- you've got to talk to them. They're going to be on top of stuff anyways, or they should be, but you need to make sure you have a good interaction with them in case there's questions that come up or you need to have them do something. Then make sure you acquire whatever resources you need. It's better to get all your resources in place before you really, really need them, because if you really, really need them, you're not going to

get them-- that's how that works. So you want to make sure that if you're going to need three tons of dry ice to restock your freezers that you have it onsite before you need it. Worst case scenario you've paid for dry ice you don't need, but you might. If your freezers go down [and] you don't have it, then you're in a problem. Like I said, it's better to be overprepared than underprepared.

You also need to initiate certain activities, so if there's certain processes that need to happen early in the planning stage, get those moving so that you don't have to play catch-up. Then if you have to do infrastructure modifications then get those going, like in our case, if we had to shut down a lab, there's things we would do, like taping doors and such, we can start doing some of this stuff. Then if you need to document your actions, which you probably should do... these days it's really important to document everything so that way you can go back and carefully keep track of what you did, and document. And you'll come back and say, "What did you do?" You can say, "This is exactly what I did." It's easier to do that when you're going through the process than it is to try to remember what you did later on. Then, of course, make sure that everybody who needs to be involved is involved.

### **Slide 20: Post event analysis**

Post-event analysis-- After Action Reviews are really, really important. We use these for simple stuff in our building, including animal experiments. We have big studies. When something finishes, we go through them after the experiments just to make sure we have a conversation about how things went, good things and bad things. But in the case of an event or even a drill, it's important to have these reviews so you can kind of go through the processes, and the things that did work and the things that didn't work. And when you do this, you want to make sure you focus in on the facts. This is not for finger pointing, this is not for blaming. This is for, what did we do? Did it work? Did it not? Yes, no, why/why not. So if you did the plan and it worked, there's going to be some sort of things that you can modify to make the plan better next time, and so you need to do those things. If you didn't execute the plan, then you need to ask why you didn't. And if it didn't work, you also need to ask why not. Then go through your lessons learned/ process to identify any potential changes you can make in the plan to make those changes. Pretty much any time you have a drill or an event, you're going to have lessons learned, and you're going to have changes in your plan that need to be made. So it's important to be open and not blame people for various things. You need to be able to have an open conversation to make improvements. If it's a whole lot of finger pointing, then it's not a productive use of time.

### **Slide 21: Root causes of plan failure**

If you do have plan failure, there's typically a certain set of causes you can go back to identify. Some of these fundamentals are; leadership -- if you have poor leadership, then you're always going to have a problem because (certainly I've found over the years) if you've got some people in leadership positions who don't want the responsibility or they don't want to do something, then trying to work around that is really difficult. If you have organizational failures, then that can also be a problem, because you have to make sure you have the right people making the right decisions at the right time. And teamwork-- with all this stuff, like any laboratory setting, if you're doing animal studies, or a lot of things, teamwork is critically important, and you have to be able to work together. Certainly in an emergency, you certainly have to be able to work together to get things done. And if you can't do that, there is going to be... it's not going to be... it's not going to work. That is a really critical issue. Of course, communication-- a lot of times, communication is sort of a problem with a lot of these other things. If leaders don't want to communicate down to other staff, or if they want to communicate outside the institution, then that can be a problem. All these things are really critical. It's not just, obviously, risk or incident management issues, but that's sort of in general. Those four fundamentals really are important.

As far as your planning process goes, other root causes of failures (or failure)-- were the objectives and individual process clear? Because sometimes if it's not really clear, people interpret things a different way. You need to make sure when you have these things that you write so it's very, very clear. If you happen to be somewhere that has multilingual communities, maybe you need to have your plans in different languages to help facilitate communication. Were drills or exercises appropriate? A lot of times probably not, because as I said earlier, whatever you planned for is probably not what happened, and so... but drills can give you a good idea of potential sticky points. If your drills were completely off base, then you need to readdress how you're doing your drills.

Did you have all of your resource needs, and were they clearly identified? A lot of times, people forget the things that they don't have enough of-- do you have enough extra Tyvek suits? Do you have enough batteries for your PAPRs? Do you have enough N95s? I mean, if you think back to the beginning of the COVID pandemic, we have a fine example of a lack of resources when you clearly needed it. So that's the sort of stuff you have to think about.

And so was the approach for implementation of your risk mitigation strategies-- was that also clear? This sort of goes back also to the objective of this topic; if you're not clear on what your implementation plan is, then it's hard for people to follow it.

As far as support goes, were external partners fully engaged? Do they know what was going on? Did they have-- were they doing their part of the job? So that's also a critical aspect to think. This also goes back to communication and teamwork and organization that really focuses on making sure your external partners are doing their job. Then of course external resources, do you have those available if you need something from outside of your institution or your facility, can you get them?

## **Slide 22: Lessons Learned**

So lessons learned-- this is with a lot of things... just general life events, I suppose. There's always things to be learned from pretty much any situation. In the case of a disaster or things like that, you need to identify if there's certain events or trends that tend to happen a lot, or frequently, that you could probably address more carefully than... or you should address more carefully so that they don't happen again. These sorts of things I'd like to think would be fairly obvious, but sometimes they're not. If you do identify a problem, that's great, but you also have to figure out what that solution is. I mean, if you say, "Well, the problem is that our cell phone towers don't work," then what's your solution? You need to get ahold of the cell phone people and talk to them, or have your institution do that, and try to figure out how to fix it so that you don't have the problem with your cell phones.

You also have to think about multiple perspectives. For example, I'm more or less a PI type or in an administration type of role, so I have an idea of how things should work. But I couldn't-- I haven't worked in a lab working with mice, for example, in years, and so I don't know what the lab techs think, I don't know what the lab techs' view on this is, and hard it's going to be to do A, B, C and D. So I can say, "Yeah, yeah, just go do this," but the techs would be like, "I can't do all that in five minutes." So that's the sort of stuff that I have to take into consideration, is what the other staff needs, or what the other-- there's multiple things pulling them in different directions, and be able to let them communicate that. And make sure that we're taking different perspectives into consideration when you're going through your lessons learned and developing risk mitigation plans.

Then also, you need to figure out the best means for preventing a recurrence of whatever your event is, if you can do, or if there was a failure. Do you have a single point of failure? For example, do you have, I don't know, one autoclave when you need to have three? Do you have, in our case here, do you have a backup breathing air

system that can be used if you need to? If you do... if you do more training, will that actually be a benefit? A lot of times, more training is more training, and it's the same thing over. Especially if staff have already done it a hundred times, they frequently quit paying attention. So if you keep giving the same training over, is it going to be useful? If you have something that's new and better and more up-to-date, is that something that's going to be more beneficial to the staff in resolving potential problems? Are there certain tasks that are too complex or too cumbersome, or they think is-- a lot of times if you have a complex task or something that's really hard to do, people aren't going to do it. They're going to do the easier thing and then come back to the hard thing when they really have to. Sometimes the really-have-to part is too late. So you need to figure out how to keep that task from being problematic. If they are difficult to do, then you've got to make sure-- and this goes to the next bullet-- that you have enough people or stuff to help get those tasks completed without making it too hard on the staff.

Then I keep coming back to communication, but there's always a way to make your communication better. I put a question mark, but that's sort of a statement, because any time you have any sort of event, communication is going to be a problem.

### **Slide 23: Real life examples**

So now I'm going to give you some real-life examples from when I was in Galveston. This picture you see here, that's the Bolivar Peninsula the day or two after Ike came for a visit. You can see all that nice, clean sand there, that's where a whole bunch of houses used to be, and that one that's right there in the front is one that was built a few years prior to Hurricane Ike's visit, and it was built to better hurricane standards than those things that aren't there anymore. So just an example of the devastation these storms can bring.

### **Slide 24: Disclaimer part 2**

So Disclaimer Part 2, just so we're clear-- I was a faculty member at UTMB from 2005 to 2009. I'm not there anymore; I haven't been in quite a while. So what I might go through in the next little bit are from my experiences when I was down there. I don't have any current knowledge about what their current risk mitigation plans are, what their strategy is, or anything else. So this is really my opinion of what I experienced, and they really do—they have no way... in no way reflect about what the current operational strategies are at UTMB.

### **Slide 25: Personal experience- Biocontainment labs on the Gulf of Mexico**

Biocontainment labs on the Gulf of Mexico-- so if you're inclined to go into Galveston, it's actually a really quite nice place. I would recommend not going between, I would say, June 1st and maybe middle of September, because it's hot and it's humid. But otherwise, it's very pleasant. These are some touristy guide stuff on the left-hand side there. On the right-hand side, that's the University of Texas Medical Branch. That great big building right in the middle is the Galveston National Lab. Behind that with the red roof, the little 4-floor building there, that's the Keiller Building. In between the two of them is the Shope BSL-4 lab. That's the small 2,000 sq ft lab that was opened about 20 years ago. The building sort of in the middle there with the bright red roof-- that's Old Red. That is the original medical school in the State of Texas. So if you do happen to go down to Galveston-- you can see a picture of Old Red in the left-hand picture as well-- if you do happen to go down there, make sure you go for a wander around campus to see that building. It's really quite impressive. And it's kind of neat to see it.

So one of the things that, many years ago, people were asking why it is you would build a BSL lab on barrier island off the coast of Texas? And one of the answers I always give people is, "Because we know hurricanes come and we plan for them." And these buildings are—I mean, certainly GNL is-- built to deal with big, big hurricanes.

So it's not... I don't—it's one of those buildings I don't worry about even the least bit. If you look at the GNL, that little thing sticking off the left-hand side (maybe this mouse works)-- but the whole thing sticking out of the left-hand side there-- there's two ginormous generators in there that can operate the GNL plus some of the buildings around it, including the Keiller Building in the case of a hurricane. So they're well-prepared for events that can happen down there.

### **Slide 26: Recognizing Risks**

So in Galveston, hurricanes are the major risk. As I mentioned, it sits on a barrier island, and so from June 1st to November 1st, the hurricane season is when that is. It still seems to be shifting a little bit later, but typically in Galveston, the middle of September is sort of the end of the hurricane season. The city is protected by a 17-foot seawall that goes down to about 83rd Street or so, and it was built after the 1900 storm that essentially turned the island into that earlier picture I showed you of Bolivar. So a pretty remarkable engineering feat where they raised the entirety of the island at the time up to 17 feet. They raised houses, and they put...bringing sand underneath. It was really quite impressive. So again, if you're on the island, you might go look at that. It's pretty cool.

But the seawall is really important, because it also prevents water from moving across the island in the case of a hurricane. So, for example, you saw the picture of Bolivar. Galveston doesn't look like that because the seawall kept the water from moving across the island. The water went up, but it didn't go across at any great rate of speed, so that was really important in protecting the houses and the campus.

Of course, along with hurricanes, there's wind, there's rain, there's flooding, there's also tornadoes that show up during hurricanes. And that's something I don't think people appreciate. They're typically not great big ones, but they can still cause a whole lot of very local damage.

Flooding is also a problem in Galveston. Large rain events and tropical storms routinely cause flooding of the island. Around campus, there's areas that if it rains hard for a half hour, they're full of water. You definitely don't want to park your car there. And so flooding is a common occurrence. Whenever we get large... whenever we got large wind or rain events, this can disrupt power, water, and sewage. Earlier this year they had some storms go through there that shut off power to parts of the island for, I guess, up to a week for some of my friends.

### **Slide 27: Mitigating Risk (Planning)**

The planning strategy down there-- emergency response and hurricane preparedness processes are in place for the state, the city, university, and laboratory levels-- or they were. These entities all work together to plan for these sorts of events. Obviously with hurricanes and floods and things we know they happen, and so the different organizations work together to address potential planning questions.

Federal entities are also involved, but it's a bit more broader issue. So, for example, the Coast Guard, there's actually a Coast Guard station on the island. But the Coast Guard's involved. Across the way there's a whole bunch of chemical and oil refineries, and so the government is obviously interested in those things, in case something happens over there. Then the Navy and FEMA, all this other stuff are involved on the federal level. And some aspects of a hurricane event, you can drill them, but a lot of them can only be discussed in tabletop exercises, in part because it's a very complex situation-- and lots of moving parts. So a lot of the planning and drilling is more of a theoretical exercise than actually application. And part of this is because hurricanes don't come in at one-size-fits-all package-- I guess I've lost an "E" in there somewhere-- and you can have small

differences in landfall location; it can make a big difference in the effects. For example, now in Florida there's discussion about a 20-foot rise in storm surge, so obviously if that were to hit somewhere else, maybe you wouldn't have that. But since it's a very low-lying area, you're going to have extensive flooding. Of course, for hurricanes, it's nearly impossible to account for all the contingencies, but you have to try to think about them, even so.

### **Slide 28: Real life testing of our plans**

So real life testing of our planning strategies in Galveston. So I was down there for four years in my full- faculty [role] down there. All of it as the director of the Shope Lab, which is the small one, and this is before the Galveston National Lab officially opened.

The first was Hurricane Rita. I'd been back on the island for about a month before, or maybe two months before, Rita decided to come for a visit. And if you remember, this was maybe three or four weeks after Katrina had hit New Orleans. So this part of the Gulf Coast was hyper-sensitive to the presence of ginormous hurricanes, and Rita was exactly that. Rita was huge. It was a Category 5 at one point in time, and initially we were really concerned about it coming for a visit. Rita actually ended up turning to the east a little bit and hit basically the border between Texas and Louisiana as a Category 3 hurricane, so that's not too bad, really. But there was a storm surge of up to 15 feet.

A few years later, Ike came for a visit, and Ike was only a Category 2 hurricane when it made landfall. But it also brought with it a very large storm surge of 18 feet in Galveston city. Certainly at my house, there was about 13 feet of water where it didn't belong. So that's the part of the hurricanes that I think is a bit challenging to keep in track of is-- you can look at the wind, you can look at the rain, but understanding storm surge is a much bigger challenge.

### **Slide 29: Implementing risk mitigation plans- Rita**

So for Rita: early tracks of this hurricane had it aiming a little bit south of the... southwest of the island, which if you know anything about hurricanes is not-- would not have been ideal. You do not want to be on the northeast side of a hurricane; we call that the "dirty side." If you look at the picture moving on the right-hand side, you can see all the red coming up from the Gulf. That's pulling wind and water and moisture around. So that's the side that gets hit the worst when a hurricane's coming. Early on we thought Rita was going to just give us a real problem, and so we went into full planning mode and full activation mode for everything. As far as the BSL-4 lab went, we shut down the lab. We closed, stopped all work. We euthanized the animals in there-- it was maybe a hundred mice; it wasn't too bad-- and then locked the freezers and gas decontaminated the laboratory because we were expecting a Category 5 hurricane. And so that's a fairly complex process. The Shope Lab is tiny, it's only 2000 square foot. When you have the bigger lab like the GNL down there now, you know, that's... I think 12,000 square feet. So it's a much bigger process to try to work through all that. So getting a jump on it, getting prepared is really, really important. In the BSL-2 and BSL-3 labs, they were in the basement of the Keiller Building, that I showed you behind the Galveston National Lab there. BSL-3 animals (rodents) were euthanized, and the space decontaminated. We had some prion studies that were ongoing, so these were year-and-a-half-old studies, I think, at the time, or something like that. So those animals moved up to the third floor or fourth floor and kept up there in their microisolators.

So the impact of Rita for us

### **Slide 30: Impact**

ended up being a significant wind/rain event, with very little damage. I was actually outside downtown Galveston in the middle of the thing, and it wasn't too bad at all because as I mentioned, it ended up going east of us, and so we were on the less problematic side of the hurricane. So we just had-- mostly just rain. However, around us, as I mentioned before, Katrina had been around a few weeks prior, and so the evacuation panic was a major issue. These are some pictures below that you can see people trying to go along the highways, north, out of the Houston area. And on the right-hand side, these are school busses from various entities trying to get folks evacuated. So this was a huge problem. I had one friend of mine that it took him a day and a half to get to North Texas. You can normally do the drive he did-- you can normally do that in five or six hours. And they had to stop and try to get gas which was a problem, because all of the gas stations were rationing gas and food, and all this stuff. So it was a huge mess. There was problems evacuating nursing homes and places like that, and there is some evidence or some instances where some of the patients from these group homes didn't make the bus ride, as it were. And there were some ad hoc shelters that were also unprepared, for example, back then my wife was still in medical school. She was a third- or fourth-year medical student. She was the chief medical person at a gym in Bryan/College Station Texas, where they brought a whole bunch of evacuees. So she got to be in charge of that situation, which was not ideal.

### **Slide 31: Lessons learned**

So lessons learned after Rita-- one of the most important things from the state level was more efficient evacuation processes were absolutely required, so the state installed these contraflow capacity on the interstates. In other words, if you look at that picture on the right-hand side there, there's Jersey barriers on the left blocking the cars from being able to go and use the other side of the highway. So the state has put in areas where those things can be moved so that people can go the wrong way on the opposite side of the highway, so they can get out more efficiently. They also instituted progressive evacuations based on risk. So for example, if you are in a low-lying area right on the water, they tell you to get out sooner, but if you happen to be in North Houston, they don't tell you to leave because you're not likely to be negatively impacted by a storm. So that way, the people who are at the highest risk can get out without getting stuck. They also instituted a plan of staging fuel and other supplies at various locations to help make sure cars get fuel and people get fed if they have to evacuate.

Internal lessons [at] UTMB were mostly focused on hospital evacuations. Everything in the laboratories went reasonably well, as far as our processes went. There were some adjustments at UTMB to deal with the hospital evacuations. And I will mention that during Rita, and also during Ike, UTMB evacuated the entire hospital, which is quite impressive. It's 260-odd people, including brand new babies and people who were in the ICU, and kids in the PICU or NICU. They got all these people out of the hospital and put them somewhere else. So that, in my view, is really, really remarkable activity, and [a] huge amount of work by a lot of people.

So one of the other challenges that happened is, since Rita was essentially a non-event for us, it also may have instilled some level of complacency that could have impacted some of our future decision-making. And I say that from a personal perspective; I can't speak for anybody else at the university.



### **Slide 32: Implementing risk mitigation plans- Ike**

So when Ike came to visit, tracking suggested this hurricane would also go a bit south of us as a Category 2 hurricane, and so since it's a Category 2 hurricane, immediately our minds start thinking, "This isn't going to be a big deal," because Category 2 hurricanes are not Category 5 by any stretch. So we kind of generally assumed that we'd be back to work on Monday, and this was like on the Thursday or Friday when we were starting to talk about plans. But about 12 hours prior to landfall, it was really clear that this was going to be a bigger problem than we anticipated, because we had water coming up over the seawall; the waves were coming over the seawall. And we also had water coming up the storm drains from the back side of the island. So all the storm drains in Galveston drain into the bay behind the island, on the north side of the island. And so when the water goes up, the water comes the wrong way [through the] drains, and that's what was happening. And that became pretty clear that was going to be-- flooding was going to be a real problem.

So we stopped all the work in the ABSL-3 and the ABSL-4 labs. Animals in the ABSL-3 were euthanized. Again, we had a small number of animals in ABSL-4; they were also euthanized, but we did not gas decontaminate the lab, which turned out to be a mistake. Not an overly critical mistake, but it was a mistake we made, nonetheless. And then we had some animals in the ABSL-2 that were moved from the basement of the Keiller Building to other facilities on the campus, which while I wouldn't call that a mistake necessarily, it definitely became a little bit of a challenge later on. And again, UTMB evacuated the hospital, and that's a picture on the bottom right, of basically a long line of ambulances coming to pick up people, not to mention the helicopters going off the other side of the building.

### **Slide 33- Impact**

So the impact of Ike-- the hospital itself had up to six feet of water in certain places, the basement or the lower levels of the hospital were all flooded. And then this caused the hospital to close in pretty much all capacities for several months. The ED was closed, I believe, for close to a year. Initially it was a Level 1 Trauma Center, and it took some number of years to get that back, which is critical, particularly considering the gas and the fuel refineries and chemical places across the bay, because it's really important to have the Level 1 Trauma Center there to support their work. And then medical education on the island was removed to remote sites for over a year. So for example, at that time my wife was a resident on the island, and she got to do her residency training in Austin and Corpus Christi and a few other places, instead of Galveston.

Animals, mostly mice in the ABSL-2 were euthanized. Again, this was a problem; a lot of this stuff was up on the higher floors and there was no AC, no medical waste disposal, no elevator. So we only had a couple of staff members who were doing all this, and they were having to go up and down the stairs and work in very unpleasant, very, very humid and very, very hot conditions to do this stuff. And it was a fantastic amount of work that these couple of individuals did.

For campus recovery staff that were on site, it took a few days, but eventually we got some Porta Johns and some outside hand washing stations. Otherwise we had no access to either running water or bathrooms, which was a problem. The waste management systems on the island were flooded and not functional. Many of the generators on the campus were-- most of them, anyways-- were destroyed or they were flooded, so they didn't work. We didn't obviously have showers for several weeks, either. Once we were able to get some portable generators onsite, it got some operations going, but it wasn't generally enough to run AC units in most places on campus. It was enough to run fans and try to get things cleared out and do some really critical infrastructure things, like that they could be operated-- including we connected the generators on the GNL to the Keiller Buildings, so we could at least get electricity on there, so we could keep the freezers running. We were doing a

whole bunch of hauling dry ice up and down stairs. And I had to go into the BSL-4 lab that we had not decontaminated, that's the important part of why I mentioned that. Had to go in there, while it was about 90 degrees, and move freezers around so they could get some airflow around them and not break. So yeah, it was quite an event.

The island and the campus were closed for about a month, until utilities and, importantly, waste management could be brought online. There was a lot of unhappy people about that. But letting everybody back on the island would have been a mess. And, of course, research on the campus was significantly reduced for many months. Obviously this impacted a number of research programs. We had a lot of support from NIAID at the time as far as funding and delayed funding and extended funding, and things like that, that allowed research to continue longer than different grant applications might have been otherwise.

### **Slide 34: Impact- Biocontainment facilities**

As far as the biocontainment facility, I will note that picture on the right is one I took out of my office window. It got worse than that, quite a bit, but that will give you some idea how much water was where it didn't belong. As far as the containment facilities went, Galveston National Lab, even though the university owned it and had for about three weeks prior to the Hurricane Ike coming, it was nowhere near operational. But we did have some administrative and faculty-- facility spaces were occupied, so there were staff in it. In fact, for part of the recovery effort, that's where I stayed, because it's just easier than in my office, which was in an adjacent building. But the GNL itself, there was some water that came in under the back door on the loading dock, and then some came in the side door that a little bit of water got on the rugs and things like that, but overall, that was it. Like I said, this building is built for it.

The adjacent Keiller Building suffered significant damage to the basement: it essentially filled up with water. And quite frankly, if we had been able to keep electricity in that building and the sump pumps were able to keep running, we probably would have saved the basement of that building. But once the generator that supported that building flooded, the sump pumps went out, and the basement flooded in a big hurry. I think they ended up having eight or nine feet of water down there; basically the entire floor was filled up. This included vacant ABSL-2 and ABSL-3 facilities. As I mentioned, all of the animals were either euthanized or moved. Insectary spaces were also empty; all the insects in there had been euthanized, I guess-- however you eliminate mosquitoes. And then the research labs were all flooded. The Shope Lab lost all power, but the bioseals and the ventilation system, we were able to maintain those, which is good, so we didn't lose containment. We had a backup system that worked fine. These were just basically air bottles like you would see... like your CO2 bottle and things-- that size. We had a bunch of them. Those kept the doors sealed, which was good. Then two days after Ike came, the construction company that built the Keiller Building came and connected the generators in the GNL to Keiller, to Shope specifically, so we could at least repower the emergency power to keep freezers working and so we wouldn't have to move dry ice up and down. So the freezers were on, but the ventilation systems were not. But it did allow us, at least in the Shope Lab, to open up the bioseals so we could at least get some level of airflow and some venting out of the space.

### **Slide 35: Lessons learned**

So lessons learned-- the category of hurricane does not necessarily correlate with the storm surge. In fact, after Hurricane Ike, the National Hurricane Center changed the Saffir-Simpson Scale to reflect that the hurricane category is only indicative to wind speed and does not take into consideration the storm surge and the barometric pressure. The barometric pressure is a way to think about how powerful the storm is going to be. But in this circumstance now-- I don't remember what the hurricane down in Florida is right now (I think maybe a

3?), but the storm surge is significant. So they are two very different things, and it's important to take them into consideration differently.

UTMB also developed a new infrastructure plan, from what I can see. Some of it had started before I left, but it looks like more has been implemented since then. Even while I was down there, critical capabilities like the blood bank, the pharmacy, and lots of things like that were moved to higher floors in the hospital. So basically if the first floor did flood again, they weren't going to lose very, very important aspects of the hospital. Most of the emergency generators were lifted higher off the floor so that-- or higher off the ground-- so that if we did get a 15-foot storm surge, that they were not going to get taken out. Importantly, some of the switchgear that goes with that, because everybody says, "Oh, raise the generator," but if all the switchgear is on the ground, then that kind of defeats the purpose. But all that stuff was raised up. And then also, critical utilities were upgraded and made more resilient. I saw something the other day that they've constructed this new 'District Heating and Cooling Plant' that has a big wall around it, that will hopefully prove some of the resiliency. But a lot of the plumbing for that goes underground, so we'll have to see.

So one of the things that you also learn is, no hurricane or tropical storm should ever be underestimated in regards to its potential impact on anything, in particular on laboratory and healthcare systems. If you want an example of that, go back to Hurricane Beryl that came through Houston earlier in this year. I have in-laws that live in the northeast part of Houston, up by the big airport, and they were out of power for a week or so. So that was a fairly small hurricane event. But the flooding that came with it and the downed power lines and stuff were a huge problem. In Houston in particular, it's a problem because it's such a big city; the resources needed to fix things are... it's really a lot.

#### **Slide 36: Questions**

All right, so that's all I have. A little bit long, but I hope everybody learned something. And if you have any questions, please let me know. Thanks.

>>*Megan Clark*: Well, thank you so much, Dr. Holbrook. That was fantastic. We do have a few questions that came in through the Q & A box, so we will go through some of those. The first question is, how soon before Rita hitting did you shut down your labs and move your animals? What kind of timeline were you looking at?

>>*Dr. Michael Holbrook*: Let's see, I think we had the lab fully-- the animals were moved probably two days prior, and the lab was deconned maybe 36-- yeah, well, I think we started the decon about two days prior, because it takes about 12 hours to decon and inactivation and venting, and so on. So we were-- everything was ready by 36 hours prior to Rita coming.

>>*Megan Clark*: Excellent. Our next question is, if your institution has both BSL-2 and BSL-3 animal facilities, do you need to have separate emergency response plans for each?

>>*Dr. Michael Holbrook*: I think that it really depends a little bit. It depends probably in part on if they're co-located, you could probably get away with one. But if they're in different buildings, or different scales, for example, then maybe you want to have something different. And it also depends, I mean if you have like have one animal-- in Galveston it's called the Animal Resource Center, that sort of-- if one animal oversight group, you could probably get away with one of them. But it may also depend on exactly how you operate. If you operate as sort of one entity, then you'd be probably fine. But that's really sort of an institutional and circumstantial question, I would think.

>>*Megan Clark*: Thank you. Here's another question about Rita. In the face of Rita, you said you pre-emptively euthanized your ABSL-3 and 4 animals. How did the PIs conducting the research react to this? Were they aware of the plan ahead of time? And did they sign off on these plans before starting the research, etc.?

>>*Dr. Michael Holbrook*: Well, for the BSL-4 stuff, yes they agreed to it because they didn't have a choice. Everybody knows that that was our emergency response plan. Certainly back in those days, for example, we know when hurricane season is, we know when peak hurricanes tend to come. So certainly for my case and the other guy-- there was only really two PIs that were impacted when Rita came on the BSL-4 side of things. BSL-3 was a bigger problem. But most of the folks, they know what's coming. And everybody-- when Rita was coming, everybody knew that it was going to be a problem. So that wasn't a concern. Now had we made the same decisions when Ike was coming, there probably would have been more pushback because people, like I said, we said, "Oh, we're going to be back to work on Monday, it's not that big a deal, it'll be fine." But obviously that's not what happened. But in the case of Rita, there was-- I...there was not any debate. I mean, that thing, it was huge. If you're interested to go back and look at some of the National Weather Service pictures and stuff, I mean, she was an absolute monster.

>>*Megan Clark*: We have a question about the scope of plans. Does your plan address ways to support the homes and families of staffers who have committed to be on campus to address the disaster, individuals who would otherwise be with their families preparing for the natural disaster?

>>*Dr. Michael Holbrook*: So not specifically in the plan. And I will say from-- my approach is, what we did with our-- because the way UTMB works, or worked at that time is, there are certain people who are designated as emergency response persons who are onsite, emergency response people. We call them E1, is what they were at the time. So people who had that designation knew that they were going to be there if something happened. It was sort of up to them to make sure that whatever home planning stuff that they had to do was addressed by somebody who may not have been them. That being said, it was certainly possible (if somebody lived off the island, for example, or if they were on the island, even better) that they could go home, get some stuff together, come back, as long as they were-- when they needed to be onsite that they were there. So that was sort of how that worked.

So I'll give you an example. When I lived-- for both these things I lived on the island, so I could go home, get my house all put together and packed up and put all my stuff up on the counters and kitchen table, and all that stuff, in case it flooded, and then come back to work and be ready when the hurricane came. My wife was there too, so we put all the dogs and stuff in the car, with some friends, and off they went to North Houston, and so on. There's not anything written specifically, I think, as far as how that's going to be managed at a specific person level. But the overall scope of what people's roles are when these things happen is pretty clearly defined. So they had, at that time, they had the E1s who were on-site there, and they had E2 which I think were the "come back as soon as you possibly could" folks. Then there was another layer down after that. So for them, that's how they managed.

>>*Megan Clark*: Thank you. You spoke a lot about the plans for mice during the storms. What about plans for larger animals? Did you have any experience with that that you could share?

>>*Dr. Michael Holbrook*: So at that time, we weren't doing any non-human primate work. I think there was only one non-human primate on the campus, I'm not sure what-- I mean she was around afterwards, so I'm not sure what they did with her. But then we did have some small livestock experiments with pigs, mostly. There was a burn center down there, so they did some experiments like that. And I don't know the answer. I think for Rita, I imagine everything/everybody was euthanized, except for that one non-human primate. For Ike my recollection

is that some of them were not, and that was a part of the challenge that we had to address. But that was not something that I specifically had to deal with.

>>*Megan Clark*: Thank you. [Pause] We'll give folks just a couple of more moments to think of any questions that they might have. I'm going to throw one for you while we're giving people a chance to think. What would you say is the most commonly forgotten item in disaster preparedness-- the one thing people overlook the most?

>>*Dr. Michael Holbrook*: You know, that's a good question. Um...[Pause] You know, I can't really think of anything in particular that would be a-- I keep coming back to staff management, sort of going back to the question of, how do you make sure that staff have the resources they need to be able to get... or take care of their house or take care of their family before they have to come in to their job? That's probably-- aspects of that are probably one of the bigger challenges with most situations, I think. [Pause] But I can't think of any one thing that could fit into all categories. I mean, obviously you need-- in almost any situation you're going to have problems with communication and people not being notified or alerted, or whatever it's going to be. I think that's going to happen. But I don't know that it's necessarily forgotten. Aspects of it may be forgotten or missed or something, but...

>>*Megan Clark*: Well, thank you. I see a raised hand. Julie, would you like to unmute and ask a question? [Pause] Or you can ask a question in the Q and A or in the chat, too. [Pause. Hand lowers] Not a problem, sometimes those hands go up in Zoom.

Well, I would like to just ask you one final question before we close. What would be kind of your parting thought for everyone? If you could take one thing away, what would you want us to think about?

>>*Dr. Michael Holbrook*: You know, I think... I think you know one of the things that -- I went through this thing about how you plan for these issues in your work environment. But I think it's also really important to make sure you go through the same processes in your home environment. Whether it's a snowstorm or a rainstorm, or whatever it's going to be, I mean it's easy to think about what you have to do at work, but I think a lot of time, people don't think ahead for their own personal circumstance. For example, if you've got-- it's hurricane season, do you have a go-bag, or something that you can get hold of quickly to be able to get you and your family out and safe in a short period of time? Growing up in Oklahoma, you had all these people that had storm cellars, and things like that. Those don't happen-- there are not quite as many of those as there used to be, but if you have one or if you have a safe room, you want to-- people always tend to keep stuff in there in case they had to hop in there for something. But I would say that's the one thing that you always want to keep in mind, is your home life as well, and not just the work stuff. Because a lot of times, you don't have the emergency response plan typically at home. You don't have disaster planning drills and stuff. Some people might, but most people don't. So maybe take some of the work lessons home with you.

>>*Megan Clark*: Thank you. We had another one slip in here, and a great question. How did you involve the IACUC in your disaster planning?

>>*Dr. Michael Holbrook*: In our facility here in Maryland, our chief vet is (and she's obviously on the ACUC) so she is involved in all the disaster unit risk management planning we do. And in Galveston, the ACUC was a very much integrated process. In fact, when I mentioned that two people were having to go back and euthanize a whole bunch of mice, one of them was the head of the Animal Resource Group. So obviously he's in the ACUC. But there-- down there in that particular circumstance, everybody understands what the deal is. So a lot of it's sort of second nature, I guess. But obviously a storm's coming, everybody knows it's coming. The university sends out

its alerts. Actually in a lot of cases, the ACUC or the animal care group were actually sending out notifications of what to do and whose staff is going to help, and all this kind of stuff. So it was a very interactive process with them. So it wasn't really alerting them, it was just a part of the deal.

>>Megan Clark: Thank you--

>>Dr. Michael Holbrook: But that situation, too, any other place and it would be a different process. So that's part of your risk planning and communication process that you need to make sure you put in place.

>>Megan Clark: Excellent. Well, thank you so much. The questions have kind of stopped coming in, but you can always send questions to the Division of Policy and Education at OLAW, and we can try to append those to the transcript as well, if you think of something after we get off.

We will be having another webinar hopefully here in a few months, in the winter season. So be sure to pay attention to the OLAW newsletters. You can sign up for all our newsletters; the link is available on our website, and keep apprised of both when the materials for this webinar will be available, as well as future announcements. Once again, a big round of applause for Dr. Holbrook. Thank you so much, and we will see you all, hopefully, in a few months. Take care.

>>Dr. Michael Holbrook: Thanks, everybody.

#### **End of slides**

There were no additional questions after the event

*While this educational program was planned independent of the events in the 2024 hurricane season, it happened that Hurricane Helene made landfall in Florida a few hours after this webinar. We honor those who lost their lives and recognize the brave responders who participated in rescue, recovery, and reconstruction efforts.*