WEBINAR:

(May 16, 2024) Webinar: M-finite Applications of the M-Series (MRI)

Questions and answers from the May 16,2024 webinar titled: "*M-finite Applications of the M-Series*"

This document includes questions we received and answered during the webinar, as well as those that we did not have time to address.

Is the body coil M3 Only?

Kara Wendel: There are body coils for each of the M. Series which includes M3, M5, and then the M7. So, the M3 and the M7 body coils work slightly differently where they slide over the animal bed. But for the M5, the body coils are inserted through the back flange, and then the animal handling system is inserted through the front. So those are both still automatically tuned and matched, so that component of the ease of use is still applicable across all of the M-Series.

How long does it typically take to acquire the images?

Kara Wendel: The length of image acquisition really depends on what the goal of the data is. So, in the instance you're looking to do tumor screening or detection. It could range from 2 to 5 minutes. If you're looking for very specific anatomy or a very small region in the brain, it can range based on the resolution you're looking for. It can range anywhere from 2 minutes to 15 minutes, depending again on the application that you're looking for. Myself and Steve also can help everyone go through that to understand what the parameters mean and the sort of resolution that you would need to delineate the particular area of the body or anatomy.

What are the performance stats of the system TE, TR, and The Gradient Field Range?

Kara Wendel: The TR and the TE you can program in with your sequences. So, all these sequences are open on the front end when you acquire. You're able to make those adjustments, those changes to TR and TE. If you have either an interest or background in MR physics or sequence composition, all the parameters are accessible, either through the quick access tab, or even through the advanced parameters. You can make those adjustments and then there's also pre-loaded sequences that come on the system. In terms of the gradient field range, the system operates at 1T. I also have a spec sheet that I can share with Steve. If you'd like to share that with everyone that goes through like the gradient strength, the slew rate, all that information as well.

What is the downtime processing multiple mice? So how long does it take to switch from one mouse to the next?

Kara Wendel: The downtime depends. The more frequently you scan, the easier it gets. I will say for me, It's pretty quick. I prefer to anesthetize the next animal, while the first animal is being imaged. That really helps increase the throughput or decrease the amount of time of downtime. But it's fairly quick to switch animals. If the animal is anesthetized, you can pull out the animal handling system, remove the mouse. Then you can put the next mouse in, apply the eye lubricant, and then place them inside the magnet. So it can be very quick, especially if you're imaging either the same area of the body, the same organ. It's very quick.

Speaking on the topic of imaging does fur shaving improve the image somewhat?

Kara Wendel: No, because there's no inner interference from the fur. Essentially, because the way that MR works has to be a proton filled area, so fur doesn't impact the image whatsoever. Areas like the lungs or air filled organs which don't have many protons will have less signal. Alternatively, if the tissues been dehydrated through after ex vivo tissue harvesting or long term storage, that can decrease the number of protons and ultimately the signal. That will have more effect than something like fur.

Where is the system physically at UIC? And can this be moved between buildings?

Steve Schnell: it could be moved. It won't be. It is in the first floor of Jackson Hall, on the north side. We have a dedicated room just for this facility, and it's use.

How long does the tumor volume calculation take on average? And how large are the image files? Where will the UMN users store or access their data?

Kara Wendel: In terms of the tumor volume calculation, it really depends. Within VivoQuant, which will they have access to at the UIC there's various tools where it can help you outline or threshold to help streamline the analysis. In my opinion, it can go fairly quick. It just depends on again the tools that you want to use to do your analysis. Whatever you choose to do, to do it across all the time points and across all of the participants or animals within your study.

How large are the image files?

Kara Wendel: So, the image files are pretty small surprisingly. Steve and I also discussed this when we looked at how large the exported data is and they're fairly small. They're easy to transport. I have just your standard like USB key. I have hundreds of scans on it. And then, Steve, do you want to speak on where UMN users will store access their data.

Steve Schnell: Yeah, absolutely. We have a transfer server that's available for all of our UIC workers or users. You just can put it on the transfer server, and then you pull it off and put it in your lab's data management program.

Is the data analysis tied to the instrument? Or can it be executed on separate machines?

Kara Wendel: So the data analysis can be done on any computer in theory. All of the images are exported as DICOM. They also have the option to export, as Jpeg and tiff, other image file formats. So, most of the time we would recommend exporting them as DICOM but you can pull them into either VivoQuant which the UIC has or other into other third party software even into something like image. J, in order to do data analysis. So, it really is up to you in terms of once you acquire images, how you choose to process them. The UIC will have VivoQuant available but there are also other options.

Is the UIC planning to offer a storage space? Or is it up to the user to retain all the data?

Steve Schnell: All of data that is generated by any of our instruments is the responsibility of the user. We do provide, as I mentioned, a method of transferring them from the instrument to a transfer server, and then each user can then pull them off from there and again put them in their own

lab management and data management program. Very easy to do, very easy.

I know you mentioned bioluminescence imaging. Is there a fluorescence imaging capability as well?

Kara Wendel: So, for the MRI there is no bioluminescence or fluorescence that can be acquired at the same time. However, there are contrast agents that can be used with the systme, oftentimes gadolinium or iron oxide nanoparticles can be used. Oftentimes, if they're targeted, we can hone them to specific areas of the brain and you can visualize the differentiation either in those organs or where they accumulate. So, there's a couple of examples from Texas children's hospital who have done contrast agent work that is targeted to tau protein in the brain. They were able to look at tau load in Alzheimer's animals. So, it certain cases, it can provide similar information to bioluminescence or fluorescence . But you wouldn't get the histology level resolution that you would get using fluorescence and bioluminescence. Also, they can't be acquired at the same time as MRI, but has been performed sequentially.

Mark Sanders: And just to build on that. The university imaging centers at the Jackson Hall location and our cancer and cardiovascular Research Building location have an IVIS spectrum that has the ability to do both bioluminescence and fluorescence imaging of small animals, and the tools and experience to help correlate that data will be available.