

WEBINAR: Preclinical DXA for *In Vivo* Body Composition and Bone Mineral Density Measurements

Questions and answers from the February 2, 2021 webinar titled “Preclinical DXA for In Vivo Body Composition and Bone Mineral Density Measurements”

This document includes questions we received and answered during the webinar, as well as those that we did not have time to address. Questions have been grouped into relevant categories.

iNSiGHT System Operation

1. **Are there any preparation steps needed to perform DXA imaging?**
 - a. No. There is no need to administer any compounds or contrast agents to generate the data shown here. Nor is there any need to remove the hair, or any other procedure. As the images take approximately 25 seconds to acquire, it is imperative that the animal remain still – this is accomplished through light anesthesia, as the imaging is painless and will not require a surgical plane of anesthesia.
 - b. The system can be configured with an isoflurane anesthesia system, or you may choose to use an injectable anesthetic.

2. **Is there a specific calibration or quality control method supplied with the system to ensure correct measurements over time?**
 - a. Yes. There is a daily test function available on the system, and the required phantom is supplied with the instrument. It is recommended that at the start of each imaging day that this test is completed for quality control.
 - b. The “DailyTest” option appears within the welcome screen of the software, the phantom is placed, and the system will complete the test. If successful, the system will notify the user, and the results will be added to the daily check log.

3. Do you know if there is a maximum number of DXA sessions that can be done on a single animal over the course of a longitudinal study?
 - a. In some animal care committee guidelines, there are notes that mice can readily recover from whole body exposures of 0.25 to 0.5 Gy per day. In studies performed by Osteosys, and the standard exposures of mice in the system, they could in theory be exposed several hundred times a day.
 - b. However, I think it is important to take into account what would be needed in a study and understand that the energies of the iNSiGHT system have been minimized to reduce any effect the DXA imaging would have on the longitudinal progression of the study.
 - c. Please note, that in practice due to the variability in the tolerance of different strains and individual mice to the effects of radiation, efforts to predict and prevent radiation-induced morbidity and mortality are imperfect. Therefore, daily monitoring is essential to ensure humane treatment of the animals.

iNSiGHT Image Display and Measurements

4. When working with the images, can the user choose to display only the overlay for lean or fat mass?
 - a. Yes. A newly added software option will allow the user to overlay the bone mineral image with the color image showing both lean and fat mass. However, if desirable, the user can select only to show the lean or fat mass, with or without the bone mineral image.
5. In addition to the standard body composition measurements that appear to be possible with the system, can a linear measurement be made, for example on a specific bone – such as the femur?
 - a. Yes. The analysis software allows you to make linear measurements on the x-ray attenuation image. Given the quality and resolution of this image it would be possible to make accurate and reproducible measurements of bone length, especially on the femur.

6. Is there offline analysis software available, and in what format is the data available?
 - a. Yes, there is an option for offline analysis software. This will allow images to be analyzed remotely, on another computer. This may be very important as we move through the COVID pandemic, or to preserve the time available on the system for acquisition and not analysis.
 - b. Once analyzed the data is available for export in .csv or txt format, while images may be exported in standard formats for presentations.

7. Is it possible to define a region of interest for cortical bone and trabecular bone inside of a long bone, such as the femur?
 - a. At this time, this capability is not yet offered on the iNSiGHT system. However, the team at Osteosys is continuously considering adding new capabilities to the system and software analysis.

Applications for DXA Imaging

8. The applications of this type of imaging for bone diseases and metabolic disorders resulting in changes in body composition in clear. However, you mention applications in drug safety and toxicology. Can you expand on where this type of imaging could be relevant to this type of work?
 - a. Definitely, this is a great question. When identifying potential therapeutic compounds, it is of course of key importance to pick compounds that are effective at treating the disease of interest. However, it is also very important to understand if those potentially therapeutic compounds will have an unexpected effect on body composition – for example decline in bone mineral density, or lean mass. These effects would need to be fully understood and taken into account when weighing the negative effects of the compound compared to the potential therapeutic benefits.

9. Can this system be used to study changes in body composition over a longitudinal study?
- a. Yes. There are several important things to keep in mind when performing a longitudinal study.
 - i. Will the imaging effect the course of the study – here we need to look at the amount of radiation required to generate the images. The radiation dose is minimized at all times to remain very low dose, having minimal if any effect on the animals throughout the study – allowing for repeated imaging at various timepoints throughout the study. All images are acquired non-invasively and very quickly, requiring only minimal anesthesia.
 - ii. Can my animals be transported to the equipment and returned to their holding area for the entire study – here it is important to consider your specific situation. Here the iNSIGHT system is quite flexible. The system is fully shielded and requires only a normal electrical outlet. Making it simple to install this system within an animal facility, or existing laboratory environment, right next to other equipment.

Additional Imaging Modes

10. Is it possible to use this system to take a regular digital x-ray image?
- a. Yes. There is a DR, or digital radiography mode. In this mode the user can adjust the voltage, current, and time for a single energy exposure.

Comparison of DXA to Other Imaging Modalities

11. Has there been a comparison study done between μ CT and DXA imaging for bone mineral density?
- b. Yes. There is a DR, or digital radiography mode. In this mode the user can adjust the voltage, current, and time for a single energy exposure.

Manufacturer Information

12. Can you tell us more about the manufacturer of this system?

- a. Sure, the iNSIGHT system is manufactured in Korea by Osteosys. Osteosys was established in 2000 and has been a player in the clinical market of body composition analysis systems, including both quantitative ultrasound systems, as well as peripheral, and central DXA systems. They have over 17,000 systems installed worldwide in 98 countries. Osteosys sought to design a preclinical DXA system taking into account their vast research and development experience in these systems within the clinical space. They acknowledged a gap in the market as the predecessor from GE, the Lunas Piximus, is no longer available. They set out to design a self-shielded system which was easier to operate. Additionally, with the implementation of a cone beam x-ray source and flat panel detector the scan time could be reduced while increasing resolution and image quality.
- b. Scintica Instrumentation, as many of you know works to bring well engineered products from around the world to researchers who could benefit from using them in their studies. Late last year we started to look more closely at the iNSIGHT system, after a bit of market research we could see the gap in the DXA market and recognized the quality of the Osteosys product. We are excited to bring this system to the North American market and look forward to learning more about the various research applications that can benefit from it's use.