

## MEDB 1.11 Bone Densitometry

### 3.2 Medical Requirements Overview

**TABLE 3.2: MEDICAL REQUIREMENTS OVERVIEW**

<b>MEDB# and Title:</b>	MEDB 1.11 Bone Densitometry
<b>Sponsor:</b>	Medical Operations
<b>Discipline:</b>	Bone, Muscle & Exercise
<b>Category:</b>	Medical Requirements (MR)
<b>References:</b>	Medical Evaluation Documents (MED) Volume B Section 1.11
<b>Purpose/Objectives:</b>	To track individual skeletal integrity (loss and recovery) by the measurement of areal bone mineral density [BMD] by DXA modality [Dual-energy x-ray absorptiometry]. This application is particularly with regard to long-duration flight, and to aid in targeting rehabilitation efforts and facilitating a timely re-certification for long duration missions. Data are also pooled and analyzed to aid in assessing the relative efficacy of countermeasures and rehabilitation programs.
<b>Measurement Parameters:</b>	A lateral spine morphometric scan and Dual-Energy X-ray Absorptiometry (DXA) scans of whole body, hips, spine, heel, and wrist regions.
<b>Deliverables:</b>	Skeletal health report, evaluation of in-flight countermeasures, skeletal recovery postflight with concurrent rehabilitation recommendations.
<b>Flight Duration:</b>	> 30 days
<b>Number of Flights:</b>	All long duration missions
<b>Number and Type of Crew Members Required:</b>	All primary ISS crewmembers.
<b>Other Flight Characteristics:</b>	Pre- and postflight data collection only

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### 3.3 Preflight Training: None

### 3.4 Preflight Activities

**TABLE 3.4: PREFLIGHT ACTIVITIES**

<b>Preflight Activity</b>	<b>Description:</b>	Data collection includes a lateral spine morphometric scan and DXA scans to include a whole body scan and regional scans of both proximal femurs (hips), spine, calcaneus (heel), and wrist. The crewmember removes all metal (jewelry, etc.), dons a pair of cotton medical scrubs, and lies down on the padded scan table. The technician positions the crewmember for each scan. Whole body scans take approximately 15 minutes; spine, hips, heel and wrist scans take approximately 5 minutes each. The scan data are stored as digital information on the densitometer's computer; analysis is performed later by the technician and a summary report generated.			
	<b>Schedule:</b>	<b>Duration:</b> DXA Scans 60 min.	<b>Schedule:</b> AME L-21/18 month; L-180/30 day (As close to launch as feasible)	<b>Flexibility:</b> Within specified range	<b>Personnel Required:</b> Lab personnel and Crew
<b>Ground Support Requirements</b>	<b>Hardware/Software</b>	<b>Preflight Hardware:</b> Hologic Discovery W DXA Scanner	<b>Preflight Software:</b> N/A	<b>Test Location:</b> U.S.	
<b>Testing Facilities</b>	<b>Minimum Room Dimensions:</b>	<b>Number of Electrical Outlets:</b>	<b>Temperature Requirements:</b>	<b>Special Lighting:</b>	
	10' x 11.5'	2-4 (110V)	Ambient	Ability to dim lights	
	<b>Hot or Cold Running Water:</b>	<b>Privacy Requirements:</b>	<b>Vibration/Acoustic Isolation:</b>	<b>Other:</b>	
	N/A	Room with controlled access and area for clothes change	N/A	N/A	
<b>Constraints/Special Requirements:</b>	<p>1. All female patients presenting for a DXA scan will have a pregnancy test accomplished prior to the DXA scan and the result verified as negative with the following three exceptions:</p> <ul style="list-style-type: none"> <li>• The patient no longer has a uterus.</li> <li>• The patient is greater than one year post menopause.</li> <li>• The patient has a documented negative pregnancy test obtained during the three days preceding the DXA scan.</li> </ul> <p>2. All DXAs must be done on the same machine for all data collections.</p> <p>3. No radioisotopes or radiopaque contrast agents for one week prior to test. Remove all metal (jewelry, etc.).</p> <p>4. Session requires level 3 medical monitoring.</p>				
<b>Launch Delay Requirements:</b>	One data collection will be repeated if launch is delayed by more than five (5) months.				
<b>Notes:</b>	All DXAs must be done on the same machine for all data collections				
<b>Data Delivery</b>	Final report is delivered electronically to the crew surgeon within 14 days after testing (or no later than L-10 d). Reports are stored in the Mission Medical Information System (MMIS) and in the Flight Medicine Electronic Medical Records (EMR). Data is shared with N3.06 Nutritional Assessments.				

### 3.5 In-Flight Activities: None

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### 3.6 Postflight Activities

**TABLE 3.6: POSTFLIGHT ACTIVITIES**

<b>Postflight Activity Description:</b>	Postflight data collection will be completed within the first 5-30 days of return, and then as clinically indicated to assess BMD recovery (i.e., values are within approximately 2% of baseline). If complete recovery is documented, further measurements will not be obtained until the next scheduled longitudinal measurement or until crewmember is assigned to another long duration mission and begins preflight testing.			
	<b>Schedule:</b>	<b>Duration:</b>	<b>Schedule:</b>	<b>Personnel Required:</b>
	DXA Scans 60 min.	R+5/30, then as clinically indicated to assess BMD recovery.	Within specified range	Lab Personnel and Crew
<b>Ground Support Requirements Hardware/Software</b>	<b>Postflight Hardware:</b>		<b>Postflight Software:</b>	<b>Test Location:</b>
	Hologic QDR 4500 W DXA Scanner		N/A	U.S.
<b>Testing Facilities</b>	<b>Minimum Room Dimensions:</b>	<b>Number of Electrical Outlets:</b>	<b>Temperature Requirements:</b>	<b>Special Lighting:</b>
	10' X 11.5'	2-4 (110V)	Ambient	Capability to dim lights
	<b>Hot or Cold Running Water:</b>	<b>Privacy Requirements:</b>	<b>Vibration/Acoustic Isolation:</b>	<b>Other:</b>
	N/A	Room with controlled access and area for clothes change	N/A	N/A
<b>Constraints/Special Requirements:</b>	<p>1. All female patients presenting for a DXA scan will have a pregnancy test accomplished prior to the DXA scan and the result verified as negative with the following three exceptions:</p> <ul style="list-style-type: none"> <li>The patient no longer has a uterus.</li> <li>The patient is greater than one year post menopause.</li> <li>The patient has a documented negative pregnancy test obtained during the three days preceding the DXA scan.</li> </ul> <p>2. No radioisotopes or radiopaque contrast agents for one week prior to test. Remove all metal (jewelry, etc.).</p> <p>3. Session requires level 3 medical monitoring.</p>			
<b>Data Delivery</b>	Reports are stored in the Mission Medical Information System and in the Electronic Medical Record. Data is shared with N3.06 Nutritional Assessments.			

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## 3.7 Summary Schedule

**TABLE 3.7: SUMMARY SCHEDULE**

ACTIVITY	DURATION	SCHEDULE	FLEXIBILITY	PERSONNEL REQUIRED	CONSTRAINTS
<b>Preflight Training: None</b>					
<b>Preflight Activity</b>					
DXA Scans	60 min.	AME L-21/18 m; L-180/30 d (As close to launch as feasible)	Within specified range	Lab personnel and crew	1. All female patients presenting for a DXA scan will have a pregnancy test accomplished prior to the DXA scan and the result verified as negative with the following three exceptions: <ul style="list-style-type: none"> <li>• The patient no longer has a uterus.</li> <li>• The patient is greater than one year post menopause.</li> <li>• The patient has a documented negative pregnancy test obtained during the three days preceding the DXA scan.</li> </ul> 2. DXAs must be done on the same machine for all data collections. 3. No radioisotopes or radiopaque contrast agents for one week prior to test. Remove all metal (jewelry, etc.). 4. Session requires level 3 medical monitoring.
<b>In-Flight Activity: None</b>					
<b>Postflight Activity</b>					
DXA Scans	60 min.	R+5/30, then as clinically indicated to assess BMD recovery.	Within specified range	Lab personnel and crew	Same as preflight