**HHC - Risk of Early Onset Osteoporosis due to Spaceflight**

**PPBE20 FY18G2 Baseline**

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<td><strong>Mars Fly-by</strong>&lt;br&gt;Gateway Lifecycle Milestones</td>
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<td>Early Onset Osteoporosis (Osteo)</td>
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**Osteo 1: Bone Standard**
A new acceptable bone health standard using an expanded surrogate for bone health needs to be defined for the flight environment.

**Osteo 2: Osteo Prevalence**
What is the incidence & prevalence of early onset osteoporosis or fragility fractures due to exposure to spaceflight?

**Osteo 3: Fracture Risk ID**
We need a validated clinically relevant method for assessing the effect of spaceflight on osteoporosis or fracture risk in long-duration astronauts.

**Osteo 4: Countermeasures**
We don’t know the contribution of each risk factor on bone loss and recovery of bone strength, and which factors are the best targets for countermeasures application.

**Osteo 5: In-flight Monitoring**
We need an inflight capability to monitor bone turnover and bone mass changes during spaceflight.

**Osteo 7: Mitigation**
We need to identify options for mitigating early onset osteoporosis before, during and after spaceflight.

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**Risk Defined Milestones**

- GW SRR: Std/Req Veh/Hab Des
- GW PDR (Proj): HW/Prot Hab/Veh IF
- EM-1: SRR (proj): HW/Prot Hab/Veh IF
- EM-2: PDR (proj): Crew Sel (proj)
- EM-3: ISS End
- EM-4: Crew Spec (proj)
- EM-5: Standalone HW/SW
- EM-6: ISS End
- EM-7: Standalone HW/SW
- EM-8: ISS End

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**Bone Standard Updates**

- RCAP 3
- FE Task Group Meeting II
- Hip QCT
- SHFH: Vertebral Strength Analysis II
- Bone Epidemiologic Analysis (380)
- Calcium Isotope-Flight
- Bisphosphonates SMO (56)
- Bone Turnover Markers (Biochem Profile)