Introduction

Human exposure to lead has been associated with multiple toxic effects. Studies of lead exposure in astronauts exposed to lead during spaceflight have shown that levels of PbB and bone mineral density increased in astronauts who were exposed to lead during spaceflight. The effects of lead exposure on bone health have been studied extensively, and the relationship between lead exposure and bone lead concentration has been recognized as significant. Lead exposure has been shown to increase the risk of osteoporosis in astronauts. However, the relationship between lead exposure and bone lead concentration is complex and depends on various factors such as lead exposure, age, and body composition.

Modeling of Blood Lead Levels in Astronauts Exposed to Microgravity-Accelerated Bone Loss

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Fig. 1. The effect of bone loss rate (BLR) on PbB and bone Pb for individuals with low and high concentrations of PbW. The model runs included individuals with low PbW concentrations (0.6 µg Pb/L) and high PbW concentrations (9 µg Pb/L). The model predicted that, for most astronauts (i.e., those with low levels of Pb in blood and bones), long duration missions to LEO would not result in an increase in PbB. However, for astronauts with high PbW concentrations, long duration missions to LEO could result in an increase in PbB.

The PBPK model results show that the factor having the most influence on PbB values in microgravity is the rate of bone loss. The model predicted that, for most astronauts (i.e., those with low levels of Pb in blood and bones), long duration missions to LEO would not result in an increase in PbB. However, for astronauts with high PbW concentrations, long duration missions to LEO could result in an increase in PbB. The model predicted that, for most astronauts (i.e., those with low levels of Pb in blood and bones), long duration missions to LEO would not result in an increase in PbB. However, for astronauts with high PbW concentrations, long duration missions to LEO could result in an increase in PbB. The model predicted that, for most astronauts (i.e., those with low levels of Pb in blood and bones), long duration missions to LEO would not result in an increase in PbB. However, for astronauts with high PbW concentrations, long duration missions to LEO could result in an increase in PbB.