Ocular Outcomes Comparison Between 14- and 70-day Head-down Tilt Bed Rest

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BACKGROUND
• Ophthalmological changes have been recently reported in some astronauts involved in long-duration space missions:

  - Elevated intracranial pressure resulting from µG-induced cephalad fluid shifts may be responsible for most of these findings
  - Head-down tilt bed rest (HDTBR) produces cephalad fluid shifts; used to simulate the effects of µG on the human body

PURPOSE
• To compare structural and functional ocular outcomes between 14- and 70-day HDTBR in healthy human subjects.
• Hypothesis: 70-day HDTBR induces ocular changes of greater magnitude as compared to 14-day HDTBR

METHODS
• Two integrated, multidisciplinary studies conducted at NASA Flight Analogs Research Unit (FARU): 14- and 70-day 6° HDTBR
• NASA standard HDTBR screening procedures (healthy adults)

STANDARDIZED CONDITIONS
- Subject to rest in bed at all times
- Monitoring by a subject monitor and an in room camera 24 hrs a day
- Daily measurement of vital signs, body weight, fluid intake and fluid output
- No napping permitted between 6:00 am and 10:00 pm
- Standardized diet

NASA Flight Analogs Research Unit (FARU)

70 days HDTBR Duration 14 days

OCULAR EXAMS:
- Yes; 2 office visits Pre-BR
- Yes; Weekly (FARU) During BR
- Yes; 2 office visits Post-BR

RESULTS

<table>
<thead>
<tr>
<th>14-day HDTBR</th>
<th>70-day HDTBR</th>
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<tbody>
<tr>
<td>Age (Years)</td>
<td>37.75 (8.78)</td>
</tr>
<tr>
<td>Gender (Male/Female)</td>
<td>12/4</td>
</tr>
<tr>
<td>Ethnicity: Caucasian/African-American</td>
<td>10/5</td>
</tr>
<tr>
<td>Others</td>
<td>1</td>
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</tbody>
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• Pre/post-HDTBR differences in near visual acuity, spherical equivalent, IOP and SD-OCT average RNFL thickness were compared between the two studies

CONCLUSIONS
• There were no significant pre/post-HDTBR differences between 14- and 70-day HDTBR for the structural and functional ophthalmological variables evaluated
• Further HDTBR studies with different duration and/or angle of tilt and/or environmental conditions (e.g., high CO2 exposure during HDTBR) may help determine the validity of the HDTBR analog to investigate microgravity-induced ophthalmological changes

SUPPORT
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DISCLOSURE
Cromwell, RL None; Taibbi, G None; Zanello, SB None; Yarbough, PO None; Ploutz-Snyder, RJ None; Vizzeri, G None
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