NASA HRP INVESTIGATORS MEETING

INTEGRATED IMMUNE

February 2, 2009
Objectives

• Address significant lack of data regarding immune status during flight.

• Replace several recent immune studies with one comprehensive study that will include in-flight sampling.

• Determine the in-flight status of immunity, physiological stress, viral immunity/reactivation.

• Determine the clinical risk related to immune dysregulation for exploration class spaceflight.

• Determine the appropriate monitoring strategy for spaceflight-associated immune dysfunction, that could be used for the evaluation of countermeasures.
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<td>• Virus specific T cell number</td>
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<td><strong>JSC Microbiology Laboratory</strong></td>
<td>• Latent herpesvirus reactivation (saliva/urine)</td>
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<td>• Circadian rhythm analysis</td>
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SUBJECTS

Completed to date:
  10 Short duration
  5 Long duration

Total ‘n’:
  17 Short duration
  17 Long duration
A. Immunophenotype, T cell function, intracellular/secerted cytokine profiles.
• No in-flight changes in bulk leukocyte subsets
• Post-flight granulocytosis
• Late in-flight/postflight elevated B cells, reduced NK cells
• In-flight, post-flight trend towards elevated CD4:CD8 ratio, elevated memory T cell subsets
• Elevated effector memory, central memory in-flight
• No change in peripheral constitutively activated T cells
CD8+ T CELL FUNCTION: A+B 24 hours

 SEA+SEB 24hr

- CD4/CD69
- CD8/CD69
- CD4/CD69/CD25
- CD8/CD69/CD25

CD8+ T CELL FUNCTION: A+B 24 hours

ISS

CD25+ CD69+

CD69+ CD25+
CD8+ T cell – Intracellular IFNg

Secreted Cytokine Profiles (CD3/CD28 48hr)
B. Leukocyte cytokine mRNA
Gene Expression of Markers of Innate (A) and Adaptive (B) Immune Responses (short-duration flights).
Gene Expression of Markers of Innate (A) and Adaptive (B) Immune Responses (long-duration flights).

**A.**

- **TNF-α**
- **IL-1**
- **IL-6**

**B.**

- **IFN-γ (Th1 clones)**
- **IL-4 (Th2 clones)**
- **IL-10 (Treg clones)**
C. Virus specific T cell number, function, plasma stress hormone levels.
EBV T cell function - ISS

% CD8 T-cells

Collection Time

L-180 L-45 14d 2-4m 6m R+0 R+30
D. Latent herpesvirus reactivation (saliva/urine), saliva/urine stress hormones, circadian rhythm analysis.
Urine CMV Assessment

SHUTTLE

CMV copies/ml

- Sub 3
- Sub 5
- Sub 2
- sub 11
- sub 13

L-180 L-45 R+0 R+30
Urine CMV Assessment

ISS

CMV copies/ml

sub 7
sub 15
sub 12
sub 9
sub 8
sub 14
sub H

CMV copies/ml vs. Time:
L-180, L-10, R+0, R+14
Saliva VZV Assessment

SHUTTLE

VZV copies/ml

-200 -180 -160 -10 0 10 4 14 24

Pre flight During flight Post flight

-200 -180 -160 -10 0 10 16 4 14 24

VZV copies/ml

Sub 7
Sub 15
Sub 12
Sub 9
Sub 8
Sub 14
Sub H

Pre flight During flight Post flight
Questions?