

## **Pharmacological Issues for Astronauts – a 5 minute presentation**

To be presented at the Non-microgravity Provocations to Crews During Spaceflight Missions panel (organizer: Lauren Leveton) at the HRP Investigators' Workshop

Feb 4 at 10:40 – 11:40am.

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Medication-induced side effects, called “untoward effects” by pharmacologists, can be a problem with any medication. Few therapies are perfectly specific for the desired physiological activity; rather they act on multiple biological targets and result in multiple physiological effects. There are several strategies that are employed to prevent, alleviate or counteract medication-induced side effects. The administered dose may be optimized to the lowest possible amount that provides the desired therapeutic effect, with the expectation that untoward effects will be minimized by a lower dose. Empirical trials of different therapies for a particular medical problem may be used in the hopes of finding a drug with minimal side effects for a particular patient, or at least of finding a set of side effects that the patient considers tolerable. If these two strategies have been exhausted, it may be possible to administer another medication to block or ameliorate side effects. A recent search of published scientific literature has revealed that there are medications used in spaceflight that seem to be associated with a significant number of reports of untoward effects. To prevent future medical problems and to improve the well-being and productivity of crew members, it would be best to eliminate (or at least reduce) untoward effects. Reports from the literature will be examined, with the aim of identifying a strategy for reducing untoward effects.

# **Pharmacological Issues for Astronauts**

V. E. Wotring, PhD

JSC Investigators' Workshop

2/2/2010

# Sleep aids: Problem in a night-time emergency?

Less than desirable sleeping conditions (microgravity?) makes sleeping > 6 hours/night unusual for crew.

Sleep aid medications help them to fall asleep faster and stay asleep longer, ultimately resulting in improved performance and well-being.



# Sleep aids: what happens in a night-time emergency?

What happens if a crew member has to respond to an emergency during the time period of sleep medication effect?

Will they be groggy and slow to respond? Will their performance be impaired by the medication?

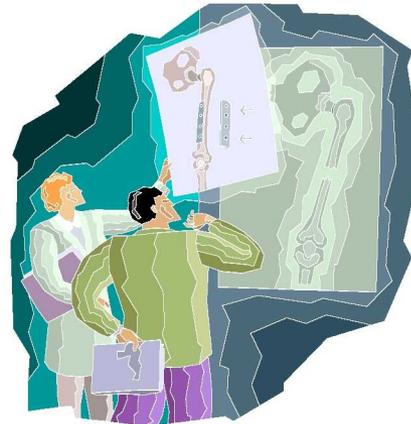
## *Research questions:*

- Determine the best sleep aids to use, that balance efficacy with residual impairment
- Test possible emergency antidotes to sleep medications

# Space Motion Sickness: Treatment leads to presyncope at landing

Nobody likes to faint. Especially in public.

People who may have experienced bone loss are at a greater risk of serious injury in a fall.



**KAREN WARREN** Chronicle  
Astronaut Dan Burbank, left, and an unidentified man help Heide Stefanyshyn-Piper after she fainted a second time Friday on a stage at Ellington Field.

# Space Motion Sickness: Treatment leads to presyncope at landing

A side effect of promethazine treatment is orthostatic hypotension and presyncope.



*Research questions:*

- Are there other space motion sickness treatments that don't have this side effect?
- Is there a countermeasure we can implement at landing?



# Space Motion Sickness: Treatment leads to urinary retention?

Promethazine treatment may have played a causal role in urinary retention

## *Research questions:*

- Are there other space motion sickness treatments that don't have this side effect?
- Is there a countermeasure we can implement?

# Space Motion Sickness: Treatment leads to sedation?

*Research questions:*

- Are there other space motion sickness treatments that don't have this side effect?
- Is there a countermeasure we can implement?

# **Polypharmacy: Drug interactions in space?**

*Research questions:*

- Promethazine + sleep aid
- Promethazine + antihistamines
- Sleep aids + antihistamines