

When traveling to high altitude, you may develop **Acute Mountain Sickness** and experience **changes in your normal breathing patterns both during sleep and while awake.**

Daytime Breathing Disturbances at High-Altitude in a Healthy Cohort



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Background

- **Acute Mountain Sickness** is the most common form of high-altitude illness.
- Hypoxia at high-altitude is thought to produce breathing instability, resulting in **disordered breathing during sleep**.
- We have observed some of these changes in awake participants, including **periodic breathing** and **apneic and hypopneic events**.
- Here we analyze for correlation between AMS and disordered daytime breathing.

Methods

Participant Selection

Inclusion Criteria

- 18-55 years old
- Enrolled in the T89 High Altitude study
- Primary residence less than or equal to 1000ft

Exclusion Criteria

- Significant medical history
- Taking any prescription medications other than birth control and study drug

T89 High Altitude Study

- 3 nights at White Mountain Research Station (3800m, 12470ft altitude)
- Assigned either T89 (study drug) or placebo

Lake Louise Score

- Used to determine presence of AMS
- At least 3 points with 1 point for headache

Intellivue Biometrics Monitoring

10 minutes of breathing

Apneic Event

Reduced thoracic movement for ≥ 10 seconds.

Hypopneic Event

50% or greater airflow reduction + 3% or more drop in O₂ sat

Periodic Breathing

≥ 3 episodes of central apnea at least 3 seconds, separated by ≤ 20 seconds of normal breathing.

Results

Demographics			
AMS?	Yes	No	
# Participants	24	21	
Average age	31.3	28.9	
Sex			
	Male	17 (71%)	8 (38%)
	Female	8 (29%)	13 (62%)
Race/ ethnicity (self-identifying)			
	White/ Caucasian	14 (58%)	11 (52%)
	Hispanic/ Latino	3 (8%)	3 (14%)
	Asian	8 (33%)	6 (29%)
	Mixed Race	0 (0%)	1 (5%)
Alcohol use?	Yes	18 (75%)	15 (71%)
	If yes, average # drinks/ day	0.26	0.28
	No	6 (25%)	6 (29%)

Table 1 Demographics of Participants by AMS Status

Graph 1

# Apneic + Hypopneic Events	AMS	No AMS
>0	12	11
=0	7	16

p value = 0.2307

Graph 2

Periodic Breathing	AMS	No AMS
Yes	16	13
No	5	11

p-value = 0.2115

Discussion

No significant correlations between likelihood of developing AMS and number of apneic/hypopneic events or periodic breathing.

Limitations

- Limited time sample of breathing (ten minutes per day)
- ECG leads were used to approximate thoracic breathing. Capnography perhaps could identify breathing pattern changes more accurately.
- T89 is unlikely to affect daytime breathing adaptations at altitude but we cannot be sure

Future Directions

- Increased time sample of breathing (ie >10 minutes)
- Separate participants by status of receiving T89 vs placebo

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