PHYSIOLOGICAL AND PATHOPHYSIOLOGICAL CHANGES IN A GROUP OF PEOPLE WHO ASCEND TO HIGH ALTITUDE IN THE SIERRA NEVADA DE SANTA MARTA, COLOMBIA

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I have no financial relationships to disclose.

I will not discuss off-label use and/or investigational use in my presentation.
Introduction

Colombia:
• Variety of racial mixtures
• Landscapes
• Tourist attractions

The Sierra Nevada de Santa Marta is an isolated mountain range separated from the Andes chain. Reaching an altitude of 5,700 m (18,700 ft) just 42 km (26 mi) from the Caribbean coast, the Sierra Nevada is the world's highest coastal range.
Introduction
Introduction

HAPE?

- lymphopenia
- neutrophilia
- inflammatory cytokines
- leukocyte

Immune response
The counseling given to travelers about the normal physiological changes, cautions, and risks to which they are exposed by changes in altitude is not sufficient.
Objective

To assess the physiological and pathophysiological changes in a group of individuals living at sea level climbing to high altitude in the Sierra Nevada de Santa Marta.
Methods

- cross-sectional study
- twelve volunteers living at sea level
- climbing to high
Methods

- Vital signs,
- oxygen saturation,
- blood samples for blood count

The Louis test was applied to the volunteers at sea level and at 2250 masl (7381 ft).
Results

Average age: 29 years

- Male: 25%
- Female: 75%

Age distribution:
- <30: 50%
- 30-50: 42%
- >50: 8%
Results

- Heart rate,
- Hemoglobin and hematocrit,
- Platelet count

All subjects increases
## Results

<table>
<thead>
<tr>
<th></th>
<th>heart rate</th>
<th>SBP</th>
<th>DBP</th>
<th>MBP</th>
<th>Sa O₂</th>
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</thead>
<tbody>
<tr>
<td>sea level</td>
<td>81,64</td>
<td>118,09</td>
<td>74,18</td>
<td>88,82</td>
<td>98,08</td>
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<tr>
<td>high altitude</td>
<td><strong>95,92</strong></td>
<td>113,83</td>
<td>74,17</td>
<td>87,39</td>
<td><strong>95,67</strong></td>
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<table>
<thead>
<tr>
<th></th>
<th>WBC</th>
<th>GRA</th>
<th>MI</th>
<th>PLT</th>
<th>HB</th>
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<tbody>
<tr>
<td>sea level</td>
<td>7,39</td>
<td>4,82</td>
<td>3,03</td>
<td>348,67</td>
<td>12,85</td>
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<tr>
<td>high altitude</td>
<td><strong>8,17</strong></td>
<td><strong>5,23</strong></td>
<td>6,21</td>
<td>421,56</td>
<td><strong>13,63</strong></td>
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</tbody>
</table>
Results
### Results

**Lake Louis Questionary**

<table>
<thead>
<tr>
<th>WBC</th>
<th>sea level</th>
<th>high altitude</th>
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<tbody>
<tr>
<td>6.62</td>
<td>6.76</td>
<td>7.42</td>
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<tr>
<td>11.6</td>
<td>13.1</td>
<td>6.56</td>
</tr>
<tr>
<td>6.56</td>
<td>11.9</td>
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</table>

Acute mountain sickness: 33%
Discussion

- Increased heart rate, hemoglobin and platelet count to high altitude climbing as it has been shown in previous studies.

- The increase in leukocytes in people with Acute Mountain Sickness (AMS) suggests that hypoxia aggression act as a triggering immune response.

- Further studies are required to establish the relationship between immune indicators and AMS, so it will work for prognosis and prevention.
Limitations

• No probabilistic sample
• More studies are needed
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