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OBSERVATIONS ON "MOUNTAIN SICKNESS"

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Mountain Sickness is a combination of ailments usually affecting people who ascend to altitudes above 10,000 feet in too short a time for acclimatization. Severity of this illness can vary from a subacute irritation to a disabling or fatal attack. Recommended medicines merely suppress the symptoms; the illness can only be cured by descent to lower elevations.

Case histories are recorded for eleven climbers who simultaneously attempted to climb Pico de Orizaba (18,696 feet), Mexico, in less than one-tenth the time recommended for physiological adaptation to 18,000-foot elevations. All climbers experienced some degree of sickness, three classed as serious (Indiv. 1, 6, 11), two as mild (Indiv. 2,4), and the rest as slight cases.

INTRODUCTION

In recent years, with increased interest in the sports of mountaineering and climbing, more people have been ascending to higher altitudes than ever before. These ascents have usually been associated with a syndrome of physiological imbalances grouped under the general term "mountain sickness." These imbalances range in degree from minor irritations to acute form which can result in death. The speed and severity of the onset of symptoms can, in most instances, be attributed to the rate of ascent, but the ultimate complex of factors involved has yet to be uncovered. One important relationship seems to be the interaction between the reduced oxygen concentration in the atmosphere and individual variation in the ability of a person to adapt to these concentrations.

In the initial phases mountain sickness is characterized by shortness of breath, loss of appetite, dehydration, headache, nausea and vertigo; in the advanced stages, all of the primary symptoms become more severe and may be complicated by pulmonary or cerebral edema and retinal hemorrhaging. Generally up to elevations of 10,000 feet healthy adults experience no unpleasantness from the effects of the altitude; above this elevation the percentage of individuals affected increases. Above 14,000 feet the majority of people experience varying degrees of discomfort.

Some degree of physiological adaptation can be gained through slow ascents covering various spans of time in relation to the altitude attempted. One suggested rate of climb is as follows: "(An elevation of 10,000 feet can be reached) within hours from sea-level, and after a day or two at that altitude to climb to 14,000 feet at the rate of 1,000 feet or less each

day. Above 14,000 feet, 500 vertical feet per day is fast enough. And above 18,000 feet all rules are off; the individual must find his own pace." (Houston, 1972) In some tropical regions of the world there are mountains which by their very nature can be ascended to 14,000 feet relatively easily either by car or on horseback. From that point on, higher elevations are then readily accessible to anyone rash enough to attempt them without prior acclimatization.

Medicines are currently available to relieve certain symptoms of mountain sickness; climbing parties attempting major ascents should make a critical study of their needs and procure the necessary items. Diamox, reputed to relieve symptoms of pulmonary or cerebral edema, and other drugs merely help alleviate the symptoms and provide temporarily relief from mountain sickness. A real cure can be obtained only by descending to lower elevations. Wilkerson (1967) provides excellent discussions of medicines used in mountaineering.

METHODS

The writer was among a group of eleven individuals (ten males, one female) who attempted a climb of Pico de Orizaba (18,696 feet) in the state of Tlaxcala, central Mexico in December 1972. This paper provides a summary of the physical reactions of the climbers before and after the climb. All climbers were apparently in excellent physical condition and had participated in some form of physical training within two weeks of the ascent.

Orizaba, the third highest peak in North America, is a relatively non-technical climb. The base of the mountain, at 14,500 feet, is a six hour drive from Puebla, Mexico (elev. 7,500 feet). A climb from base to summit requires 12 hours (averaging 3 hr./1,000 feet). Climbers were organized in rope teams of three or four members and the pace was set by the slowest member, usually the one affected by mountain sickness. Therefore some individuals were restrained from moving faster, thereby conserving their energy and taxing themselves less.

The rate of ascent was as follows:

- Day 1 — Six hour drive from Puebla (elev. 7,500 ft.) to Hidalgo (elev. 11,000 ft.) Spent 14 hours at 11,000 feet.
- Day 2 — Six hour hike from Hidalgo to Base Camp (14,500 ft.) at the foot of the mountain. Spent 12 hours at Base Camp.
- Day 3 — Twelve hour climb from Base Camp to summit (18,000+ ft.) and four hour descent back to Base Camp.
- Day 4 — Three hour hike to Hidalgo.

The group drove from 7,500 feet to 11,000 feet and remained there over a 20 hour period. Mild exertion characterized a six hour climb in reaching 14,500 feet; here the group rested for 12 hours. Extreme exertion was expended over 12 hours while climbing from 14,500 to 18,000+ feet.



FIG. 1: View of Pico de Orizaba as seen from 11,000 feet at the village of Hidalgo, Mexico.

CASE HISTORIES

Individual No. 1—Male, Age 22

This individual was the only member to drive directly to this elevation from the previous night's camp. Four hours after arrival No. 1 experienced severe headaches and nausea only partially relieved by aspirin. He returned to lower elevations and did not attempt the climb. After descending the headache and nausea abated.

Individual No. 2—Male, Age 20

This person experienced a mild nausea and prominent headaches during the climb above 15,000. He also noticed a "burning sensation" in his eyes which got worse when associated with a headache. Within 500 feet of the summit he experienced a headache severe enough that he considered turning back. Chest pains also occurred during the climb, lasting until descending to 11,000 feet. Through the course of the 3 days this individual took three Diamox, two salt tablets, two aspirin, and one Benadril. In 1971 this person attempted this same mountain in the same manner, experiencing almost identical physical ills. That year, though, he was forced to turn back approximately 500

feet from the top due to a combination of factors, the most prominent of which was severe wind and cold.

Individual No. 3—Male, Age 22

Throughout the climb this person experienced no ill effects other than a mild headache on reaching the Base Camp at 14,500 and a dry cough on the way down from the summit. Through the course of the three days this individual took four salt tablets and two multiple vitamin pills. In 1971, he also attempted this same mountain in the same manner, experiencing the same lack of physical ills. At that time, even in the face of severe wind and cold, the summit was attained.

Individual No. 4—Male, Age 30

At 11,000 feet this individual contracted a mild headache and nausea with vomiting; these ills increased during the hike to Base Camp and caused considerable loss of sleep at that camp. A mild headache, loss of appetite and weakness occurred on the day of the climb. The weakness apparently being due to loss of food. Two days after the climb a mild blood congestion was noticed in the nasal passages. During the climb this individual took five Diamox, five Excedrin, and two Alka-seltzer.

Individual No. 5—Female, Age 30

At approximately 17,000 feet a mild headache and nausea occurred; this illness continued until return to Base Camp. During the climb this individual took two salt tablets, four Diamox, three Anacin, two multiple vitamin pills and two vitamin A capsules.

Individual No. 6—Male, Age 30

Very mild and intermittent headaches occurred during the preclimb period. During the climb he felt well, but tired. At approximately 16,500 feet this climber experienced headaches, strong nausea and flashes of light before his eyes. At 17,000 feet he began a descent due to extreme weakness. Other symptoms encountered were mild pains in the region of the kidneys, vomiting during ascent between 16,500 and 17,500 feet, a dry cough while descending and dried blood congestion in the nasal passages after the climb. During the climb this individual took two salt tablets, six Diamox, and two Ricedrin.

Individual No. 7—Male, Age 31

This individual experienced mild nausea between 14,500 and 15,500 feet. He assisted No. 6 in his descent and therefore did not complete the climb. During this period he took one salt tablet. In 1971 No. 7 climbed to the summit of Pico de Orizaba without evident illness.

Individual No. 8—Male, Age 19

Strong headaches were felt at the preclimb Base Camp. There was an absence of nausea, but the headaches continued in a milder form during the climb. Over this period he took two salt tablets, four Diamox, and two aspirin.

Individual No. 9—Male, Age 33

A dry cough appeared during the climb and a slight nosebleed occurred after reaching the mountain's summit. During the climb he took two salt tablets, five Diamox, three multiple vitamin pills and three vitamin C pills.

Individual No. 10—Male, Age 27

This climber experienced mild nausea and headache only when trying to sleep. A dried blood discharge was found in the nasal passages two days after the climb. During the climb he took five Diamox, one salt tablet, and two aspirin.

Individual No. 11—Male, Age 27

Due to restlessness this individual slept little prior to the first day's climb at Base Camp. A mild diarrhea was also experienced the night before the climb. At approximately 17,000 feet nausea and a ringing within the ears occurred suddenly followed by painful vomiting. Afterward mild attacks of nausea, vomiting, and slight vertigo occurred. During the descent attacks of nausea and serious vertigo occurred, requiring that he be assisted by two others in his descent. No. 11 also experienced flashes of light before his eyes when they were closed. At Base Camp this climber felt remarkably better after drinking water and eating some candy. Days after the climb a slight blood discharge from the nasal passages occurred. During the climb he took four Diamox and two Lomotil.

DISCUSSION

Varying degrees of mountain sickness were experienced by eleven climbers attempting Pico de Orizaba. The degree of sickness of three individuals (1, 6, 11) required them to descend the mountain in order to regain physical composure. Above 16,000 feet, most symptoms of sickness became evident; the severity increasing up to 18,000+ feet. At altitudes above 10,000 feet individuals commonly experience a loss of both appetite and thirst. Energy requirements, however dictate a high caloric intake; with a greater than normal fluid consumption to aid in evaporative cooling of the body. Possibly much of the exhaustion and ill effects of this climb might have been alleviated, had the climbers increased their consumption of simple sugars and water.

The rapid ascent herein described is not unusual for climbing groups. Weather patterns on high peaks and natural severity of environmental conditions sometimes dictate that climbs be made only within certain narrow time spans. There is, however, a distinct danger of succumbing to mountain's sickness from over exertion.

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