Acetazolamide: Does it help on Mt Kilimanjaro?

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Choose A Challenge, Mt Kilimanjaro 2018

Background

- Acute Mountain Sickness (AMS) is common on Mt Kilimanjaro due to the rapid ascent profiles used
- Acetazolamide (Diamox) is the most commonly used medical prophylaxis agent for high altitude illness
- Diamox is a carbonic anhydrase inhibitor. However, it is not fully understood how this improves AMS. Its effects are, at least in part, attributable to the excretion of bicarbonate ions causing metabolic acidosis. This causes the respiratory rate to increase, improving oxygenation and also counteracts the respiratory alkalosis that accompanies ascent to altitude.

Objectives

1) Does taking prophylactic acetazolamide affect summit success rate on Kilimanjaro?
2) Does taking prophylactic acetazolamide affect symptoms experienced during ascent?

Methods

- 165 participants in 6 separate groups attempted Mt Kilimanjaro via the 6-day Machame route
- Participants made independent decisions regarding acetazolamide prophylaxis
- On day 4, at Karanga Camp, all participants were asked to score a range of symptoms from 1 - 5
- Exclusion criteria: Anyone who started after day 2; anyone who started or adjusted their acetazolamide due to symptoms of AMS
- Homoscedastic T-tests were used to compare symptom severity scores
- Chi-square test was used to compare categorical data

Results

Median age = 20 years
165 participants
Overall success rate 79%

Summit success rates

✓ 88% - No Diamox (n=86)
✗ 72% - Prophylactic Diamox (n=53) (P = 0.013)

Effects of taking prophylactic Diamox

✓ Increased oxygen sats 90% vs 88% (p = 0.002, n = 114)
✓ Decreased headaches 1.6 vs 2.2 (p = 0.00006, n = 122)
✗ Increased shortness of breath 2.4 vs 2.0 (p = 0.026, n = 122)
✗ Increased report of mental health concerns 22% vs 9% (n = 41; n=80; P = 0.042)

- There was no significant effect on: sleep, fatigue, appetite, gastrointestinal disturbance, or dizziness

Conclusion

In this population, taking acetazolamide was associated with significantly worse summit success rates, increased shortness of breath, and increased incidence of mental health concerns. However, it was also associated with significantly decreased headaches and improved oxygen saturations.

Limitations:
1) Only applicable to young adults on 6-day Machame route on Kilimanjaro
2) Participants taking prophylaxis was a self-selected population – possible selection bias
3) Not a blinded, randomised controlled trial
4) Variation in dose of acetazolamide prophylaxis used – although the vast majority used 125mg bd

HANDS OFF MY DOXYCYCLINE

CASES OF UNUSUAL SKIN REACTIONS

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INTRODUCTION

During a 300km trek in rural Tanzania a number of participants complained of itching, sore, red patches with or without blistering predominantly on the lateral side of the index fingers. As expedition medics we began to notice a pattern in the affected trekkers.

PRESENTATION

Around 30 participants were divided into groups of between 8 and 14 members and undertook the trek in sequence, taking around 18 days to complete the distance. The groups were self sufficient, carrying all of their equipment and living entirely out of doors.

The lesions appeared insidiously over a period of 2-4 days after the beginning of the trek and were noted to be particularly affecting the hands, while sparing the rest of the body

Those affected were predominantly female and with skin types I to III on the Fitzpatrick scale.[1]

DIFFERENTIAL DIAGNOSIS

Our differential diagnosis included:

- ***Sunburn***
- ***Contact dermatitis***
- ***Pompholyx eczema***

On reviewing the cases within each of the groups, it became apparent that the affected participants were all using Doxycycline for malaria prophylaxis, while those taking alternatives such as Atovaquone Proguanil were not affected.

TREATMENT AND OUTCOMES

A diagnosis of photosensitivity reaction secondary to Doxycyline use was made.

With limited access to steroid cream, sun protection methods were employed, including a novel use of socks with toe seams removed to cover the hands during trekking, in lieu of gloves.

On reduction of UV exposure, the condition resolved within 4-5 days.

DISCUSSION

Doxycycline use has a number of well documented side effects including photosensitivity reactions.[2]

It was unusual that the fingers were specifically affected in this group. We suggest that this may be due to frequent hand washing removing sun creams. The position of the hands, holding the straps of rucksacks or poles while walking, may also have contributed to the extremities being preferentially exposed to sunlight.

Photosensitivity reactions secondary to doxycycline use can affect unusual parts of the body during trekking and novel strategies may be employed to prevent and treat the condition

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Amazonian Tree Frog Poison
An unusual complication of the Kambô Ritual

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What is Kambô?

Kambô is the venomous secretion of *Phyllomedusa bicolor* (giant monkey frog), native to the Amazon basin. It is found in the rainforest regions of northern Brazil, eastern Peru, southeastern Colombia, parts of Venezuela, Bolivia, and the Guianas.

How is it obtained and used?

The tree frogs are nocturnal and are collected at night when they can be identified by their distinct call. Captive specimens are tied by the legs and stressed to induce the secretion. The waxy skin secretion is scraped onto wooden splinters from the back and legs of the frog, after which the frog is released. Once dried, kambô can be stored for upwards of a year without losing its potency.

How is it given and what is its use?

Kambô is mixed with saliva or water and directly applied to specially made skin burns.

It is traditionally used to treat "panema" (a condition of bad luck in hunting) and is often a precursor to an ayahuasca ceremony, involving drinking hallucinatory vine tea under the guidance of a respected Shaman.

The use of kambô spread from the Amazon basin in 1994 when a rubber tapper, Francisco Gomes, applied it in São Paulo. Since then its use by alternative practitioners has spread across the globe to treat the modern world equivalent of "panema"- likened to depression.

What does the ritual involve?

A large quantity of liquid is consumed beforehand. For example 3-5 litres of fermented corn caiçuma, banana gruel, or diluted papaya juice. The immediate effects last approximately 30-40 minutes. They include fever, dizziness, tachycardia. The blood pressure may rise or fall dramatically. Many people report a tingling or burning sensation. Other effects include inflammation of the throat, blurred vision (or temporary blindness), and numb, swollen lips and tongue.

Overwhelming nausea is unavoidable and purging is likely- either by projectile vomiting, defaecation, or both.

Case

56 yo caucasian with a lifelong history of depression presented to our hospital acutely with confusion, agitation, hyperthermia (39.4 degrees), mild coagulopathy, followed by rhabdomyolysis (Peak CK 106,180), foot drop.

24 hours earlier he had received a kambô therapy, but had taken no other drugs/medication. Toxicology and standard investigations did not identify an alternative explanation. Symptoms gradually resolved with supportive treatment.

Discussion

The tree frog scrapings of *Phyllomedusa bicolor* contain active peptides which are responsible for the effects of kambô. Not all have been identified. Some may have therapeutic potential. Dermaseptin B2 has been shown to inhibit human prostatic adenocarcinoma growth .[1] This peptide penetrates cells and induces necrosis. [2] Dermaseptins, including adenoregulin also exhibit antiparasitic effects. [3,4] Adenoregulin affects the binding of agonists to adenosine receptor, which can influence the permeability of the blood-brain barrier. [5] Deltorphin and dermorphin, are potent opioid delta receptor agonists, 4000 times more potent than morphine. [6] A tachykinin, phyllomedusin excite neurons, evokes behavioral responses, contracts smooth muscles and is a potent vasodilator and secretagogue. [7]

Conclusion

Most cases of illness and death after Kambô rituals are associated with the effects on the central nervous and cardiovascular systems. This case is the first to describe rhabdomyolysis in association with its use.

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HIGH ALTITUDE PULMONARY OEDEMA

What you didn't already know

WHAT WE DID

Pheriche, Khumbu, Nepal
Having completed the January WMT Chamonix course, In Spring 2018 my wife and I, both GPs in Central Scotland, travelled to Nepal to work for the Himalayan Rescue Association in a seasonal aid post high in the Khumbu Himalaya. Pheriche is at 4200m on the way to Everest Base Camp. Here the oxygen pressure is 60% of sea level and all trekkers and climbers are feeling the effects of altitude. As such it is a fantastic opportunity to see altitude related medical problems. Alongside a US trained fellow doctor, we provided a daily surgery, 24-hour emergency cover and gave a daily lecture on altitude problems.

We dealt with trekkers, high altitude climbers, locals, porters and guides alike.

Accommodation was rudimentary but we had excellent local support in the form of a cook and two health care assistants.
We could perform minor surgery and had a 2 bed ward for overnight patients. Equipment included a good supply of medications, oxygen concentrators, Gamow bags, and an ultrasound machine (sonosite) which we used regularly to confirm the diagnosis of High Altitude Pulmonary Oedema (HAPE).

In a remote setting High Altitude Illnesses are clinical diagnoses. However HAPE can easily be confirmed by Ultrasound, and as devices are becoming more and more portable we envisage this will become the gold standard for diagnosing HAPE.



CASE HISTORY

Patient B was carried in one evening. Having ascended to Pheriche 2 days prior, and despite a rest day he had developed increasing breathlessness over the course of the day.

Presentation
On arrival he was tachypnoeic and cyanosed. He was unable to stand, and barely conscious. His sats were 33% and sonosite USS confirmed pulmonary oedema

Treatment
He did not respond to maximum oxygen by the concentrator, and did not pick up until a concurrent tank of oxygen was set up via nasal cannula. Given acetazolamide, dexamethasone IM and nifedipine he made a remarkably quick improvement. He was able to walk himself to a waiting helicopter the following morning.

This patient presented with cerebral oedema- we were able to confirm brain swelling by ultrasounding his optic nerve(see picture). However it is clear from his history that high altitude pulmonary oedema coexisted and was the primary diagnosis-

Rapid desaturation caused by HAPE may precipitate HACE



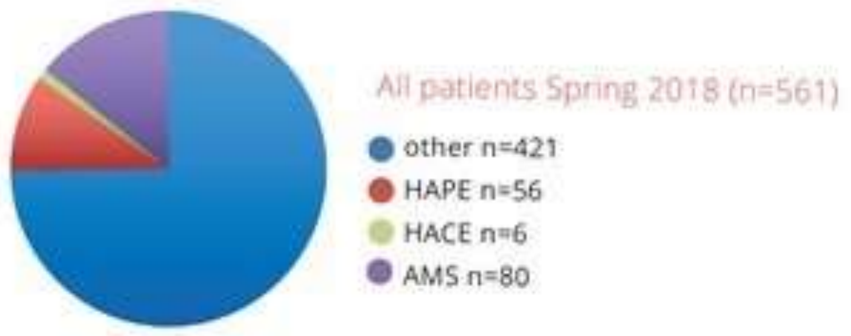
PREVALENCE OF ALTITUDE ILLNESSES

We saw 561 patients in our 8 week season with the HRA. Although Respiratory Illnesses were the most common presentation(n=271) followed by gastrointestinal(n=96) there was a lot of Altitude Illness at this altitude (4200m) Although we only recorded 80 consultations for Acute Mountain Sickness (AMS) there was undeniably a lot more folk suffering with AMS symptoms that we didn't see (many lodge owners and guides would arrange evacuation, rightly or wrongly, without the HRA being involved).

AMS is endemic at 4200m

HAPE was surprisingly common, although varied widely in its presentation from mild inconvenience to life threatening.

On Ultrasound scanning asymptomatic individuals , many had asymptomatic signs of Pulmonary Oedema



SUCCESSFUL SUMMITEER

The truth behind my health scare on Lhotse back in April
Back in April I had to descend 1000m from Everest base camp and rest for a week before returning to my climbing rotation.....This was not because of "mild altitude sickness" or a "persistent headache" it was actually because I had high altitude pulmonary oedema... extremely serious form of altitude sickness and is a major cause of death in high altitude mountaineers where your lungs are filled with fluid that slowly drowns you. Fortunately the second doctor I saw (Simon in Pheriche) at the Himalayan Rescue Association correctly diagnosed me and to my surprise (and most of the climbers I have subsequently spoken to) said it was treatable and my climb wasn't over, with the right drugs, some patience to let the symptoms subside, and extreme vigilance and care next time I ascended. We know now that it all worked out but the weeks in between were emotionally very stressful while I managed this hidden menace in my chest and questioned whether I was making a sane and safe choice. For three weeks as I climbed higher I was constantly listening for the tell-tale crackle in my lungs which would have signalled a rapid retreat down the mountain and (for) the third time a certain end to the climb.

Matt Williams

HAPE can coexist with AMS but often presents on its own. It can present with a well acclimatised patient. Whilst the first consideration for HAPE remains descent, correcting an underlying precipitant (eg infection) seeking treatment and descending to a safe place might allow HAPE to dissipate and climbing to recommence.

Matt on the summit of Lhotse, 8516m, Everest behind

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Pythium Keratitis: A Diagnostic Challenge

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Introduction

Pythium insidiosum is a parasitic oomycete, sometimes referred to as a parafungus, that infects mammals. They can be distinguished from fungi based on their cellular components, namely a differing cell wall that lacks chitin or ergosterol [1]. It is most often seen in Asian countries with majority of cases being attributed to contact with plants, dirty water and wet soil [2][3][4].

The pattern of disease is largely dependent on the site of entry and is of four main categories: cutaneous, ocular, vascular and systemic [2]. The latter two most often affect patients with thalassaemia or leukaemia [4].

Ocular pythiosis has a very high rate of morbidity as response to medical therapy is often suboptimal. If left untreated, it may worsen and cause panophthalmitis which often requires enucleation [2]. Therefore, early detection is critical in preventing visual disability.

Case History

A 26 year old female agricultural worker from Tamil Nadu, India, presented with pain, redness, reduced vision and watering from her right eye. She gave a history of a foreign body entering the eye and scrubbing it.

On initial presentation, the right eye had reduced visual acuity. Additionally, there was lid oedema, reduced corneal sensation with ciliary congestion.

Slit lamp examination revealed a corneal ulcer measuring 4x4.5mm in the paracentral area of the inferotemporal cornea. The ulcer had an elevated, dry appearance with feathery margins and satellite lesions at the 10 o'clock and 4 o'clock positions that extended into the anterior stroma. The left eye was normal on examination.

Investigations and Management

Corneal scrapings were sent for cultures and sensitivity, potassium hydroxide (KOH) mount and gram staining. KOH mount showed broad hyphae.

She was treated with linezolid 0.2% drops hourly, azithromycin ointment four-hourly, and oral azithromycin 500mg once-daily. This pharmacotherapy regimen proved to be effective.

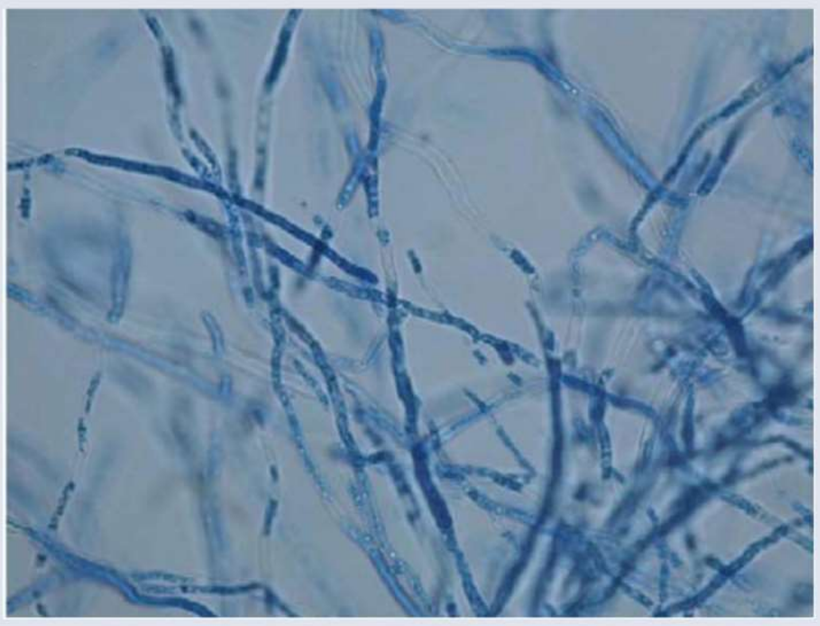

Figure 1. *Pythium insidiosum* stained with lactophenol blue [6]
image taken from Gaastra et al. (2010)

Figure 2. A slit lamp view of pythium keratitis [1]
image taken from Bagga et al. (2018)

Discussion and Learning Points

In this case, treatment involved a combination of linezolid and both topical and oral azithromycin. However, there remains no clear consensus on the best treatment modality. It can be successfully treated using antimicrobial agents with studies having evidenced effective treatment using a combination of linezolid, azithromycin and atropine sulphate [5]. Early surgical intervention consisting of debridement has been shown to improve prognosis [2].

Pythium insidiosum keratitis can often mimic fungal keratitis [1]. In severe cases of fungal keratitis that do not respond to treatment, other causes like *pythium insidiosum,* should be considered in the differential diagnosis.

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USE OF OXYGEN IN DIFFERENTIATING HEADACHES AT ALTITUDE

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Choose A Challenge Expedition Doctors, Mt Kilimanjaro 2018

BACKGROUND

- Headache is a common presentation at altitude
- Differentials include high-altitude headache, infection, migraine, hypoglycaemia, dehydration etc.
- It is crucial for expedition medics to consider all possible differentials in order to safely and effectively manage participants
- Without access to investigations, differentiating causes can be challenging
- The Oxford Handbook of Expedition & Wilderness Medicine suggests that 10-15 mins of 2L/min supplemental oxygen should resolve a high-altitude headache, unlike many other causes of headache
- In this case report, we describe how supplemental oxygen was used to diagnose high-altitude headache and effectively exclude other important differentials

Millennium Camp (3900m)
The camp below where this patient was assessed

CASE REPORT

Shortly after summiting Mt. Kilimanjaro (5895m), a 19 yo male developed a headache:

- Assessed by Dr at 4400m
- Severity 8/10; now 6/10
- C/O photophobia & fever
- Better lying down, no ataxia
- Had Men ACWY vaccine

O/E:

- GCS 15
- Normal neurological exam
- No objective meningism

Vital Signs:

- HR 90
- Sats 80%
- Pyrexia 38.4 ºC

Key Differentials:

- High-altitude headache
- Meningitis

Intervention:

- 2L supplemental oxygen via nasal cannula

OUTCOME

- Sats improved to 96% on 2L oxygen
- Within 5 minutes, the headache had completely resolved to severity 0/10
- This enabled confident diagnosis of high-altitude headache avoiding need for antibiotics
- Patient advised to continue descent and safety netted for symptoms of meningitis

CONCLUSION

- In this case, supplemental oxygen effectively treated the headache and excluded an important differential, avoiding unnecessary antibiotics and allowing rapid descent
- This is a lesson for all medics managing altitude-related conditions: important non-altitude-related diagnoses always should be considered, and a thorough history, examination and use of available resources is crucial in making the correct diagnosis

Acute Psychosis at 4863m in a 20 year old male

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Abstract

A 20 year old male experienced acute psychosis with paranoid delusions at 4863m on descent from Uhuru peak, Kilimanjaro. He had no preceding mental or physical health problems.

Introduction

- In 2011-2012 16,425 tourists attempted to summit Kilimanjaro[1]. A case series describing 175 trekkers on the Rongai route, quotes a summit rate of 85% and the incidence of acute mountain sickness in this group, to be 55%[2]
- Evidence of psychosis at altitude in the literature is lacking, but known in non-medical circles
- Medical evacuation to the nearest hospital, Kilimanajaro Christian Medical Centre (KCMC), reportedly takes between 4 and 6 hours
- This case report is the experience of one student who was trekking Kilimanjaro under the care of the authors
- The authors were medically responsible for ~350 students over a 3 week period and were stationed at Karanga Camp

Case Description

- Descending from Uhuru peak (5895m) to Millennium Camp (3827) one student, Student A, lagged behind his group of 30 by 1-2 hours, accompanied by porters
- He suffered some vomiting at Uhuru peak, then a brief, self-reported, loss of consciousness
- At Kosovo camp (4863m) Student A began expressing delusions of mild paranoia and at 4662m (Barafu Camp), he was acutely delirous with non-bizarre, persecutory type delusions, convinced the porters wanted to harm him
- Student A then, whilst continuing to descend tried to 'escape' from porters, injuring himself and attempting to harm porters in 'self defence', he was therefore restrained on a stretcher and evacuated from the mountain
- The doctors were contacted and planned to meet A at Machame Gate (exit gate of the national park)
- He was instead taken to KCMC and then back to base hotel as "doctors happy to discharge"
- Student A was assessed by doctors and found to have deep lacerations and grazes to forehead, arms and knees which occurred when he fell, trying to 'escape' the porters, otherwise no physical signs found on full examination
- Mental state exam showed partial insight to delusions but Student A still believed his experience was part of a larger plan to "teach him a lesson"
- Student A was taken to KCMC for CXR, CT head and observation – no abnormalities found, patient developed full insight into delusions and made a full recovery

Discussion

- Student A had no pre-existing health conditions, was taking Malarone for malaria prophylaxis and was not taking acetazolamide
- He had been seen by the doctors (as was routine on this trip), around 10 hours prior to summit attempt, and had a Lake Louise Score[3] of 0
- Whilst acutely unwell, Student A was a danger to himself and others. The decision to restrain was made by the porters and appropriate in this setting
- Should a doctor have been present with the team, a sedative antihistamine or a benzodiazepine could have been considered along with descent
- Student A was in fact, not initially seen and turned away at KCMC, he was refused entry as he had no method of payment

Conclusion

- The role of the expedition medic can largely centre around minor ailments in treks such as these, however, a preparedness for any eventuality should be maintained
- Mental health should be enquired about in confidential pre-expedition screening assessments, as well as discussed more generally in pre-departure briefing
- Communication is key, and all team members should agree and stick to meeting points
- We would recommend that at least one person has a credit card on them, to allow admission to hospital in an emergency

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Rabies post-exposure prophylaxis on Expedition

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Introduction

Rabies is a universally fatal acute viral encephalomyelitis, transmitted via saliva of rabid animals.

A pre-exposure three vaccine schedule is recommended for those at risk. This reduces the post-exposure treatment needed from 4 vaccines over 14 days and rabies immunoglobulin to two vaccines.[1] On expedition the vaccine may be in limited supply and refrigeration difficult. Evacuation may be necessary to acquire rabies immunoglobulin or check titres.

The recent case of the death of Briton after a cat bite[2] highlights the need to seriously consider at risk exposures for prophylaxis.

Case

Patient J, a bat handler, was bitten by a bat in Indonesia on the first day of a 12 week research expedition. Based on Public Health England guidance[3] this was a category 3, high risk exposure (Fig 1). The patient had been vaccinated 10 years ago with a 5-year booster and no titre checks subsequently. The expedition company has only two fridge stored vaccines, no supply of immunoglobulin, and no means of checking titre levels. The nearest hospital, with unknown resources, is two hours away from the current location and 12 hours from the patients next rural jungle destination.

Current organisation guidance stated that Patient J required 2 vaccines only. However, there was concern due to her at risk job and the lengthy time since her primary course and booster. Using the vaccines on her would obliterate stock for 12 weeks for any further at risk cases. The London School of Tropical Medicine advised we give the vaccines from our stores on days 0 and 3. We subsequently purchased a further two from the hospital 2 hours away to replenish stores. We did not check titre levels and allowed her to travel into the jungle after her second dose.

Country/Animal risk	Category 1 exposure	Category 2 exposure	Category 3 exposure
No risk	Green	Green	Green
Low risk	Green	Amber	Amber
High risk	Green	Amber	Red

4. Determine the post-exposure treatment required

	Post-exposure treatment		
Composite rabies risk	Non immunised/ partially immunised	Fully immunised	Immunosuppressed
Green	None	None	None
Amber	Four doses of vaccine d0, d3, d7, d21	Two doses of vaccine d0, d3-7	HRIG and five doses of vaccine d0, d3, d7, d14 and d30
Red	HRIG and four doses of vaccine d0, d3, d7, and d21	Two doses of vaccine d0, d3-7	HRIG and five doses of vaccine d0, d3, d7, d14 and d30

Fig1: Summary of Risk assessment and post-exposure treatment

Discussion

This complex case was multifaceted. Patient J's care could have been improved with group education on preventing and treating at risk rabies exposures. Consideration of supplying further vaccines in light of expedition bat handling and improved awareness of locally available resources including vaccines and immunoglobulin would have positively impacted. In at risk expeditioners it may be beneficial to consider checking titre levels and boosting prior to arriving in country to remove treatment ambiguity. Additionally, if required, advice can be sought from the Colindale duty doctor for the Rabies and Immunoglobulin Service.[3]

Current recommendations advise keeping rabies vaccines under cold chain temperatures (+2 to +8 Celsius)[4], which are often impractical rurally. However, Lankester et al[5] have demonstrated thermotolerance in a rabies vaccine which retained its ability to stimulate a neutralizing antibody response in dogs. This indicates a research gap with possible benefits to expedition medicine.
Intradermal injection was considered as an alternate option to intramuscular as its dose volumes are smaller, however, efficacy is technique dependent and necessitates training.

Fig2: Indonesian fruit bat

Conclusion

Rabies is a universally fatal illness and so expedition companies must ensure staff are adequately vaccinated and educated about rabies risks. Multiple vaccines should be available in case of high-risk exposure. Protocols should be available for medical evacuation in case of need for rabies immunoglobulin, and local medical resources should be known. Further research into thermotolerance of the rabies vaccine may benefit rural expeditions. Additionally, training in intradermal administration can reduce volume of vaccination needed and conserve stores.

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RED-S (Relative Energy Deficiency in Sport) in Long Distance Hiking

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HERE

Introduction

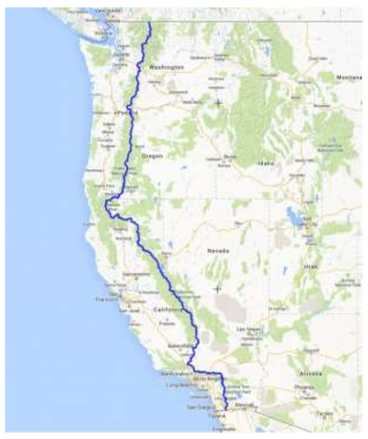
RED-S (Relative Energy Deficiency in Sport) is a syndrome which can occur in athletes and highly active individuals. It is impaired physiological functioning caused by relative energy deficiency, and includes but is not limited to impairments of metabolic rate, menstrual function, bone health, immunity, protein synthesis, and cardiovascular health.

Once the energy expenditure of exercise is taken into account, the athlete's energy intake is below that required for normal health and physiological function. It can occur in any sport but particularly in endurance sports like cycling, or where a slight physical physique is thought to be an advantage e.g. long distance running or dancing.

A personal observation during a long distance hike (the Pacific Crest Trail – 2700 miles) in 2005, was of several women who had their hike curtailed by stress fractures as well as amenorrhoea, and postulated there was a link between these observations and RED-S (formerly known as Female Athlete Triad).

The Pacific Crest Trail

The Pacific Crest Trail traverses the length of the USA, starting at the US-Mexico border, crossing California, Oregon and Washington, and finishes 2700 miles later at the US-Canadian border. Hikers typically trek 20-30 miles a day for an average of 145 days. They carry all their equipment and food. As such, there is often difficulty in consuming sufficient calories, and many hikers lose weight on the journey. This relative energy deficiency can then cause physical problems.



I noted stories of at least 2 women in our cohort who sustained significant stress fractures in their femur and tibia, which I thought was unusual in fit women in their 20s and 30s. There were also reports of stress fracture in the feet.

Method

After completing this thru-hike in 2005, I posted a questionnaire on an online hiking forum, asking female participants to answer questions about mileages, incidence of amenorrhoea and injuries in the form of stress fractures. I specifically targeted women for participation as the condition of RED-S was not yet recognised whereas Female Athlete Triad was. Now, we know that it can also affect men.

Results

I only had 17 respondents complete the questionnaire. The results are as follows:

Datapoint	Value
Average age	37
Age range	25-56
Average BMI	21.6
BMI range	18-31.3
Average miles of trail hiked	1925
Range of trail miles hiked	400-2700
Menstruating	16/17
Of which:	
Normal periods	4/16
Menstrual irregularities	12/16
Postmenopausal	1/17
Taking vitamin/calcium supplements	12/17
On combined oral contraceptive pill/HRT	5/17
Using no hormonal contraception/HRT	12/17
Stress fracture	1/17

Discussion

Functional hypothalamic amenorrhoea due to extreme exercise / RED-S has been shown to be associated with loss of trabecular, and to a lesser extent, cortical bone. Women lose 1-3% of bone mass per year after the menopause. The bone loss in amenorrhoeic athletes is equal to that of postmenopausal women. In this small group of female hikers, it is striking how many women (of those menstruating) had menstrual irregularities (12/16, or 75%). Most of these showed complete cessation of periods within 2-3 months of commencing hiking, while others had lighter/irregular periods or spotting. The prevalence of secondary amenorrhoea in the general population is reported to be just 3%. If these menstrual irregularities are an indication of anovulatory cycles and a hypoestrogenic state, then it may also indicate a relative osteopenia, with the associated increased risk of stress fractures.

SEIZURES AT ALTITUDE

C Miller, N Hudson-Peacock, A Wallace
Choose A Challenge, Mt Kilimanjaro 2018

choose a challenge

INTRODUCTION

Increasing numbers of people are travelling to high altitude as these pursuits become more popular and accessible

Seizures have been reported in previously healthy patients and those with known epilepsy . Seizures occurring at high altitude present a challenge with regards to treatment in the wilderness setting and present a risk to the patient through hypoxia-related complications and accidents associated with the seizure such as falls and head injuries.

Aim: To highlight the factors involved in lowering seizure threshold at altitude, and the importance of pre-expedition preparation

Case Report

- 22 year old female trekking Mt Kilimanjaro via 6 day Machame route
- Known epileptic, but previously never had a seizure while taking current anti-epileptic medication regime (lamotrigine 100mg twice daily)
- Complaints: 1) poor sleep; 2) diarrhoea for 3 days
- Meds: lamotrigine 100mg bd; ciprofloxacin 750mg stat; regular loperamide; not on acetazolamide
- After summiting, around 30 mins before Kosovo camp (altitude ~5000m; Fig. 1), she lost her footing and stumbled before suffering a witnessed generalised tonic-clonic seizure, which self terminated after 1 minute
- Post-ictal phase: 5 mins altered consciousness, 1 hr confusion
- Assisted by porters to Barafu camp (4600m) where she was assessed
- O/E: HR 102, sats 79%, ongoing mild confusion, no focal neurology or ataxia
- No evidence of AMS/HACE/HAPE – continued descent was advised

Fig 1. Dr A Wallace and Guide Rajabu at approximate location of seizure

Contributing factors

Sleep Deprivation

Poor sleep is the 2nd most common seizure trigger in epilepsy.
Poor sleep at altitude is common.
Respiratory alkalosis, secondary to hypoxia-induced hyperventilation, results in periodic breathing and sleep deprivation.

Hypobaric Hypoxia

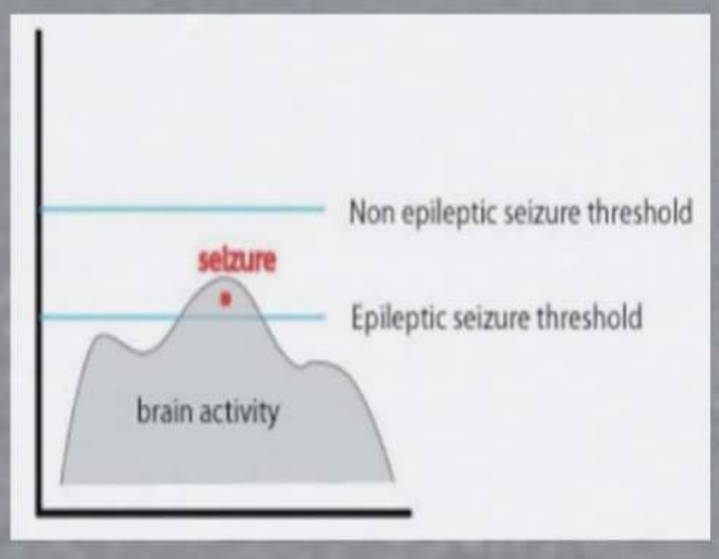
Hypoxia has been shown to increase neuronal excitability.
With saturations of 79% at Barafu camp, this was clearly a contributing factor.

Poor absorption

Lamotrigine has 98% bioavailability and is absorbed from the gastrointestinal tract.
Despite good compliance, this patient had type 7 stools for 3 days which undoubtedly affected absorption.

Physical Exhaustion

Summiting Kilimanjaro is a massive physical challenge. Furthermore, the descent route is largely scree and stumbling is common. This puts further physical strain on the body. Such extreme physical exhaustion is likely to lower seizure threshold further.



Discussion

As an expedition medic, it is necessary to prepare thoroughly for the specific requirements of the participants. Consider the following:

- **Initial consultation** – **months in advance** to allow necessary GP/specialist appointments and letters, medication optimisation, organise appropriate travel insurance, any specific training etc.
- **Medical kit** – balancing cost/weight with ability to manage **worst case scenario** eg. status epilepticus. Consider: benzodiazepines, airway adjuncts, iGel, bag valve mask, oxygen
- **Participant preparation** – participant was advised to inform her **trekking companions** of her medical condition, and what they should do in case of a seizure. She was advised to share a tent with her friend who had previously seen her seizures and knew how to manage them.
- **Expedition planning** – consider using the route with maximum possible acclimatisation and rest, consider potential evacuation plans

Case Study: **A snake bite in rural South Africa**

English, J, Paediatric ST3 Trainee, Royal Manchester Children's Hospital; Hamilton, H, Chief Medical Officer, Mosvold Hospital

Introduction

Snake bites cause significant morbidity and mortality worldwide with a predilection for the rural tropics and occurring predominantly in the developing world. With an estimated 5 million snakebites occurring per annuum, leading to between 81,000 and 138,000 deaths. (1)

Spending a year working in a small, public sector hospital in rural South Africa, I gained exposure to this presentation.

Here we describe a paediatric patient, bitten by a black mamba along with his mother. We describe the nature of the injury, presentation to hospital, stabilisation on arrival and subsequent management.

We explore the use of anti-venom, considering risk/benefit considerations of this potentially lethal treatment and challenges with its limited availability. Additionally we consider the approach to the acute management of a snake bite both in and out of hospital.

Presentation

While sleeping on the family bedroom floor, a snake entered and proceeded to bite Patient S (Aged 6) and his mother. The father subsequently killed the snake and they arrived to hospital 2 hours later with the remains of the culprit in a bag **(Picture 1)**

On arrival, he was alert and in obvious pain. He was tachycardic and tachypnoeic, with stable blood pressure. Exposure revealed puncture wounds above the left lateral malleolus, with associated gross swelling, extending proximally to his calf and distally to mid-foot.

Picture 1

Management

Acutely he was managed with opiate analgesia and 0.9% Saline fluid bolus. His wound was cleaned with Chlorhexidine solution and he was given a dose of Tetanus Immunoglobulin.

Use of Antivenom

The species was identified as a black mamba; with venom known to cause neurotoxicity and potential local cytotoxic damage. (2)

Thankfully despite a worldwide shortage of anti-venom, one dose was available within the hospital. Both mother and son were bitten, however Patient S was more systemically unwell and had more extensive swelling, therefore preferentially received treatment. He was pre-medicated with Hydrocortisone and adrenaline.

During the transfusion he became hyper-pyrexial with worsening tachycardia and wavering blood pressure and received a second dose of adrenaline along with a further fluid bolus.

He completed the transfusion and slowly regained haemodynamic stability.

Risks of Antivenom

Polyvalent anti-venom contains animal immunoglobulin developed against venoms from multiple different snakes sharing a geographical region. With a large dose of varied foreign protein administered; the vast majority will have allergic reactions, with an anaphylaxis rate reported in the region of 43% (3).

Indications for antivenom (DoH S.Africa)

Painful swelling of the whole hand or foot within one hour, spreading to elbow/knee within 3-6 hours
Swelling of head, neck or chest or bite in close proximity to airway structures
Overt neurological signs
Platelet count <100 x10^9/L or Fibrinogen <100mg/dL

Table 1

Further Management

Cytotoxic manifestations subsequently became apparent, with skin and tissue breakdown around the wound.

This was managed with daily paraffin gauze dressings and he subsequently required wound debridement in theatre. With a significant surface area involved, he ultimately required a skin graft, with skin harvested from his gluteal region and the operation undertaken by the hospitals general surgeon. **(See Picture 2).**

Picture 2

Outcome

Patient S was discharged when the graft had healed adequately. His mother did well without anti-venom and was discharged after 48 hours of observation.

Out of Hospital Care

Snake bites often occur far from hospital, therefore first aid principles are important.

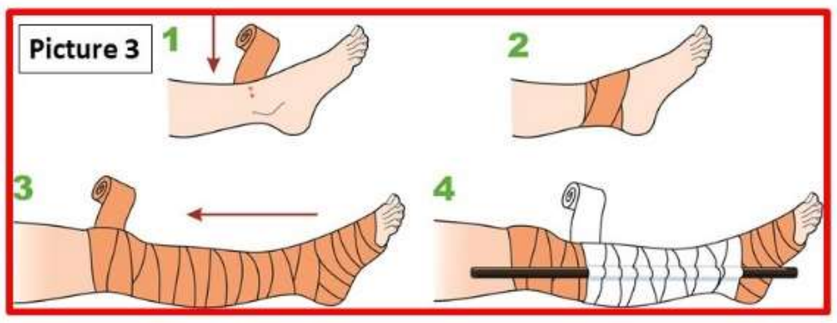
1. Immobilise area in functional position
2. Remove tight jewellery or clothing that would impair circulation
3. Fashion a splint
4. Identify the species (if safe to do so)

Avoid:

1. Oral suction of venom
2. Application of tourniquet: Risk of ischaemia

Pressure Immobilisation:

This uses an elasticated bandage to exert moderate pressure on the affected limb (without compromising circulation). In neurotoxic envenomation, this delays absorption of venom, allowing extra time to reach a hospital. However in cytotoxic envenomation it exacerbates the tissue damage. This method should only be used by those who know the toxic affects of the snake and are trained in the technique. (4)



S.African Snakes	Affect of venom	Example
Mamba Rinkhals Berg Adder	**Neurotoxic** paralysis of skeletal muscles	 (Black Mamba)
Spitting-Cobra Gaboon adder Puff Adder	**Cytotoxic** Severe local damage to tissues	 (Spitting Cobra)
Boomslang Vinesnake	**Haemotoxic** Haemolysis and coagulopathy	 (Boomslang)

Table 2

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1. *Snake bite.* **Warrell, DA.** 2010, Lancet, pp. Jan 2;375(9708):77-88.
2. *Snake-bites: appraisal of the global situation.* **JP, Chippaux.** s.l. : bulletin of the World Health Organisation, 1998, Vol. 76(5):515..
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Managing uncertainty in the WILDERNESS

Taking General practice out of the office and into the field on British Exploring Society's Expeditionary Year Expedition 2018.

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Less than half of the problems that patients present to their GP can be understood in terms of recognised disease processes(1). This coupled with the minimal selection of investigations available 'at hand' within the community, requires the often lone-working GP to be competent in dealing with a large proportion of presentations that are uncertain or ambiguous.

The Royal College of General Practitioners' curriculum outlines the need in modern generalist medical care to **manage uncertainty**, but what **strategies** are we taught to do so?

1. Using **time as a diagnostic tool**
2. Building a **good rapport** with patients
3. **Seeking advice** from colleagues/MDT
4. **Collateral history**
5. **Sharing uncertainty** with patients/relatives
6. **Safety-netting**

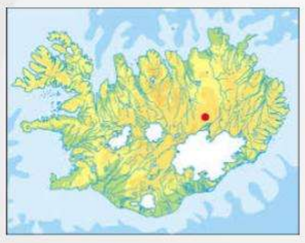
ON EXPEDITION THE PROBLEMS OF PROFESSIONAL ISOLATION AND LACK OF RESOURCES ARE TEN-FOLD. SO HOW CAN SKILLS LEARNED IN THE CONSULTING ROOM BE TRANSFERRED TO THE FIELD?

CASES MANAGED ON EXPEDITION...

Case Study- BES Expeditionary Year 2018.

Expedition specifics:

- 24 Explorers (aged 14-16), 11 leaders
- 3 weeks spent in the Icelandic wilderness
- 3 Objectives:
  - Summit Askja Volcano
  - Explore Aldeyjarfoss waterfall system
  - Summit Sellandjafell mountain



Responsibilities of Expedition Medic:

- Pre-expedition health screening
- Pre-expedition health education
- Care of explorers and leaders on expedition

- **Right iliac fossa pain** in explorer
- Associated mild fever and nausea
- Managed using **satellite telephone triage with leaders**, **daily time gap reviews** and **appropriate safety-netting**
- Outcome- reviewed in hospital after persisting symptoms for two days. Discharged back to expedition following normal investigations.

- **Partial thickness burn** in explorer
- Managed using **shared knowledge of colleagues** and **daily reviews**.
- Outcome- the case provided an opportunity for **safety education** and **building of rapport** amongst team. By **sharing uncertainty** with the explorer we were able to manage expectations of the rest of the expedition.

- **Multiple blisters/minor trauma t**o feet of leaders and explorers
- Essential to build **good rapport** with teams and encourage early disclosure of any issues
- Managed through **sharing knowledge with colleagues** to promote self care in the field and appropriate **safety-netting**.

- **Loin to groin pain in leader**
- Episode reported a day after symptoms had resolved
- Discussed potential causes for symptom whilst **sharing uncertainty**
- Regular **'check-ins'**
- Outcome- no further issues whilst on expedition. Symptoms returned a month after return- diagnosed with renal calculi.

Conclusions:

- **The ability to manage uncertainty is essential in both the General Practice and wilderness setting**
- **Skills acquired in one area can be successfully adapted and transferred to the other thus providing further evidence of the value of recruiting GPs as expedition medics**

Further thoughts:

- **As in General Practice; medical problems experienced in an expedition setting can be greatly mitigated through the practice of good preventative care**
- **Techniques such as gathering collateral history and safety-netting can be employed as early as the pre-expedition screening period in order to minimise uncertainty in the field**
- **Thorough pre-expedition health education is also essential**

References:
1.Marinker M, (1994) *The end of general practice. Bayliss lecture* (Royal College of Physicians, London).