The Newsletter of the International Society for Mountain Medicine

Volume 9, Number 2, April 1999

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International Society for Mountain Medicine

The International Society for Mountain Medicine, founded in 1985, has the following goals: to bring together physicians, scientists and allied professionals interested in mountain medicine; to encourage research on all aspects of mountains, mountain peoples and mountaineers; to organize and co-organize international scientific meetings and publish a newsletter to spread scientific and practical information about mountain medicine around the world.

FROM THE EDITOR

I am pleased that this edition of ISMM News includes another selection of excellent articles for your information and enjoyment. We have maintained a truly international feel to our Newsletter through your endeavours and I am grateful to all those who continue to contribute to the Newsletter and assist with the life of our Society. With this edition, I welcome David Murdoch as Co-Editor to replace Bengt Kayser who retired with the last edition. David will continue in his role as Website editor and will also edit the references pages for each issue. If you have particular requests or questions regarding inclusion of references on the references page, please contact David directly.

If you have friends or colleagues interested in mountain medicine then please do encourage them to join the International Society for Mountain Medicine. The Society needs to keep in touch with as many members of the mountain medicine community as possible in order to remain a representative body. Any subscription enquiry's should be directed to Bruno Durrer (address on the cover). If you haven't yet paid your 1999 subscription, please do so today.

Please note that with this edition of the Newsletter the Editors email address has changed. Please use the new email address for all future editorial correspondence.

FROM THE PRESIDENT

Many of us have just come back from the **11th International Hypoxia Symposium** held at Jasper, Canada. It was as fascinating as ever regarding all aspects of this unique congress: the scientific program, personal encounters and recreational activities in a beautiful winter scenery. On behalf of ISMM I thank the organizers, Rob Roach and Peter Hackett and their team, for their enormous efforts to move the meeting from Lake Louise to Jasper and to go on-line with options for registration and submission of abstracts as well as maintaining the character and quality of the meeting. We are already looking forward to the 12th International Hypoxia Symposium in the year 2001.

At this symposium I had the pleasure to present the first **Scientific Prize of ISMM** which consisted of 1,500 SFR and free travel and registration to the symposium. The executive committee of ISMM had chosen Andrew Mark Luks, a student of the Medical School of the University of California at San Diego for his paper entitled "Room oxygen enrichment improves sleep and subsequent day time performance at high altitude", published in Respiration Physiology 113:247-258, 1998. His co-authors were H. van Melick, R. R. Batarse, F. L. Powell, I. Grant and J. B. West. These authors set up a low-cost unit of a sleeping room for 2 people in which oxygen concentration could be increased to 24% during the night. They showed that this amount of oxygen enrichment at an altitude of 3800 m leads to increased sleep quality, to less symptoms of acute mountain sickness and improved oxygen saturation on the following morning. This paper has practical implications, especially for people commuting to high altitude for prolonged work periods as it promises improved well-being and performance. The paper will also stimulate research on the at present unknown mechanism accounting for improved daytime oxygen saturation after nocturnal oxygen enrichment. On behalf of ISMM I congratulate A. M. Luks and his co-authors for their successful work.

At this occasion I would like to draw the attention of all researchers in the field of hypoxia and mountain medicine who are below 35 years to the **Scientific Prize 2000** of ISMM which will be awarded at the IVth World Congress on Mountain Medicine and High Altitude Physiology held in Arica, Chile, from October 1 – 6, 2000. It consists again of 1500 SFR and free travel and registration at the congress in Arica. The deadline for submission of papers is March 31, 2000. Details will be published in the announcement section of the next newsletter.

At last I would like to draw your attention to the first and last page of the present newsletter. On the first page you will note the **changes in editorship** announced above by Andy Pollard. I thank Bengt Kayser once more for his long-standing engagement with the newsletter and David Murdoch for taking over another editorial responsibility. The last page should remind you that the **annual fees** are due. As of today, one quarter of the members have not yet paid their membership fees for 1999. A reminder was sent out last week. I am sure that those who have not paid yet were just too busy to care about minor things like membership fees of ISMM. I have no doubt that you all want to remain with our society and receive the newsletter. However, I am sorry to say that those who will not pay or apply for complimentary membership within the next 3 months will be removed from the mailing list of the newsletter.

Peter Bärtsch
President of ISMM

Alveolar fluid reabsorption and high altitude pulmonary edema

With this article I would like to draw your attention to a possible role of the alveolar epithelium as one factor that might contribute to formation of high altitude pulmonary edema (HAPE). Doing so I am passing over the most commonly used explanations of HAPE which are pulmonary hypertension and increased vascular permeability. Two facts leave the door open for alternate or additional explanations: (i) Pulmonary hypertension is more pronounced in HAPE-susceptibles exposed to hypoxia than in non-susceptibles, yet, not all susceptibles develop HAPE (1). (ii) Very often no history of infections was reported of mountaineers who did develop HAPE during high altitude exposure, nor were there any signs of markers of inflammation like cytokines (1). So, what else is going on? The above mentioned models explain mainly interstitial edema; what about the alveolar side?

Fluid balance in alveoli

Before evaluating other possibilities that might or might not explain HAPE processes involved in the clearance of fluid from the alveolar space have to be considered. Since one does not constantly suffer from alveolar flooding effective mechanisms of fluid removal have to be assumed. This was studied extensively on lungs in situ, on isolated, perfused lung models and on alveolar epithelial cells isolated from lung tissue that were kept in tissue culture (12;18). Beforehand, it has to be pointed out that a significant difference in fluid balance exists between the fetal and the adult lung: Whereas in the fetal lung fluid is actively secreted by distal lung epithelial cells causing the lung to be filled with fluid, the adult lung is "dry" because of fluid reabsorption (14).

In the *in situ* and isolated lung models from adult animals it was found that instilled fluid is readily reabsorbed. The site of reabsorption appeares to be the alveolar space. Addition of inhibitors indicate the significance of the Na^+/K^+ pump and of Na^+ transporting cation channels in fluid reabsorption (12,14). Reabsorption could be stimulated by a variety of substances that were added either to the instillate or the perfusate. Among the most potent ones were epinephrine and its analogues acting via cyclic AMP (12).

From these studies as well as follow up experiments on isolated lung alveolar epithelial cells a model of fluid reabsorption was derived (12) that is similar to many other reabsorptive epithelia (fig.1): Na^+/K^+ pumps located in the basolateral plasma membrane at the endothelial-alveolar interface of alveolar epithelial cells pump Na^+ out of the cell to keep the intracellular Na^+ concentration low. Due to the high extracellular Na^+, pumping generated a concentration gradient facing into the cell, which allows Na^+ to enter via various pathways located in the plasma membrane of the apical side of the cell, i.e. the side facing toward the alveolar space. Those entry pathways include Na^+ permeable ion channels and secondary active systems transporting different substances coupled to the transport of Na^+ (12). Any Na^+ that entered the cell will again be pumped out by the Na^+/K^+ pump. This creates a stream of Na^+ as well as an electrical potential (apical side negative) across the epithelium that allows chloride to follow. The reabsorption of NaCl generates the osmotic gradient that pulls water from the alveolar to the interstitial side. The pathways that mediate the movement of Cl^- and water are not very well understood.

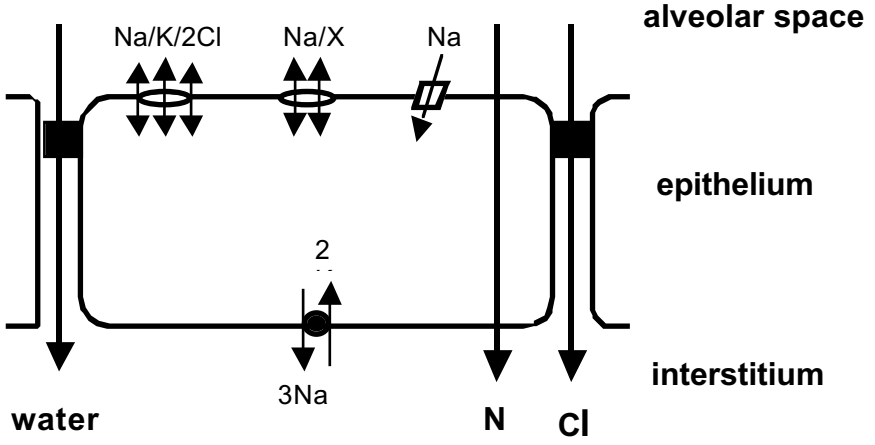

Figure 1. Model of NaCl and water reabsorption across the alveolar epithelium.

$Na^+/K^+/2Cl^-$ ... $Na^+/K^+/2Cl^-$ cotransport; Na^+/X ... Na^+ coupled cotransport;

Na^+ ... Na^+ permeable cation channels; $3Na^+/2K^+$ ... Na^+/K^+ pump.

It is not clear yet which of the cells of the alveolar barrier mediate transepithelial Na^+ and water movements. Alveolar type I cells cover most of the alveolar surface and would therefore be ideal

candidates. However, barely any Na^+/K^+ pumps have been found there. Alveolar type II cells cover only a small portion of the alveolar surface. Their major functions appear to be secretion of surfactant and repair of damaged alveolar epithelium. When isolated for primary culture these cells also perform active Na^+ transport from the apical to the basolateral cell surface that can be measured as electric current in Ussing chambers (5). During in vitro maturation alveolar type II cells differentiate to cells similar in structure and function to type I cells but still show active transport (4). In both cell types in culture the reabsorption of Na^+ can be inhibited by amiloride, a blocker of epithelial Na^+ channels (ENaC) and of non-selective, Na^+ and K^+ permeable cation channels (11). Of course, transport is also blocked by inhibiting the Na^+/K^+ pump. Other transporters like $Na^+/K^+/2Cl^-$ cotransport, Na^+/H^+ exchange, Na^+/glucose-, Na^+/phosphate- and Na^+/amino acid-cotransport seem to play only minor roles although exhibiting quite some activity (11).

A variety of substances was shown to modulate Na^+ transport in alveolar epithelial cells. β-adrenergic agonists stimulate Na^+ reabsorption by activating apical Na^+ entry mediated by the intracellular messenger adenosine 3',5'-cyclic monophosphate (cAMP) (12). Terbutaline effects on isolated lungs as well as isolated alveolar type II cells were blocked by propranolol indicating specific mechanisms (18). Cyclic AMP acts directly by affecting protein kinases or via calcium dependent mechanisms (Ca_i). An increased Ca_i was shown to activate cation transport of A549 cells (9). Non-catecholamine-dependent stimulators of alveolar Na^+ and water reabsorption include various growth factors like the epidermal growth factor, transforming growth factor and keratinocyte growth factor (6;12), which are thought to be involved in epithelial repair.

Alveolar fluid reabsorption in hypoxia

Recently, several studies documented that hypoxia might impair alveolar fluid transport. Planes et al. (17) reported an inhibition of the Na^+/K^+ pump in a cell line derived from rat alveolar epithelial cells after SV-40 virus transformation. We found that in primary cultured rat alveolar type II cells and a human lung carcinoma cell line (A549) with functions similar to type II cells hypoxia not only inhibited the Na^+/K^+ pump, but also Na^+ entry via amiloride sensitive pathways and $Na^+/K^+/2Cl^-$ cotransport (10). Planes et al. (16), reported a downregulation of the expression of ENaC and the Na^+/K^+ pump in primary cultured rat alveolar epithelial cells by hypoxia. Another very interesting result comes from Pitkänen et al. (15), who works on the transition of fetal to adult alveolar type II cells. These authors reported that fetal type II cells kept in tissue culture at about 3% O_2 estimated to match the value in the fetal lung exhibit a low capacity for transepithelial Na^+ reabsorption, whereas exposure to 21% O_2 activates Na^+ reabsorption considerably (15). They argue that the increase in PO_2 might be significant for drying the lung after birth (15).

The mechanisms that cause the hypoxic inhibition of alveolar Na^+ transport are not understood. Based on available results inhibition occurs in an initial phase by inhibition of transport probably by inactivation and/or internalization of transporters, in a second phase by inhibition of protein synthesis (10). Planes et al. (17) reported an increased Ca^{++}-entry in hypoxia and that nifedipine, the drug used successfully to prevent HAPE (2), also prevented inhibition of the Na^+/K^+ pump. However, in primary cultured rat alveolar type II cells and A549 cells this effect of nifedipine could not be confirmed (10). It is by now not known to what extent mechanisms involved in oxygen sensing by e.g. pulmonary artery smooth muscles (20) or erythropoietin-producing cells (19) also are effective in lung alveolar epithelium.

Significance of Na^+ transport for fluid reabsorption and HAPE

Reabsorption of fluid from the alveolar space is of vital significance (3). In the *perinatal lung*, when the function of the alveolar epithelium switches from secretory to reabsorption, the above described transport systems mediate the removal of fluid contained in the lungs (14). This process is stimulated by increased levels of stress hormones liberated during birth (14). The significance of Na^+ reabsorption via ENaC has recently been demonstrated impressively. Knockout mice with a deletion of the gene encoding for the α-subunit of ENaC die within about 40 hours after delivery since reabsorption of alveolar fluid is entirely absent (8). Gene recovery results in heterocygotes with a decreased amount of ENaC protein in alveolar epithelial cells. However, this seems sufficient for adequate fluid reabsorption from the lungs and survival of these mice.

In the *adult lung* reabsorption has to prevent alveolar flooding by removal of accumulated fluid, which is of importance, since the barrier for gas diffusion has to be kept as thin as possible to allow proper exchange of respiratory gases. The role of transport in clearing alveolar edema particularly of HAPE is unclear. Studies on fluid reabsorption of the intact human have been performed (13) but have not yet been applied to HAPE. It is difficult to consider what might be going on: If alveolar ion transport is inhibited by hypoxia in vivo, a diminished rate of fluid reabsorption has to be expected, which might cause alveolar edema. This, however, should occur in HAPE-susceptibles and non-susceptibles as well. Alveolar epithelial cells of HAPE-susceptibles might be exposed to an increased degree of hypoxia because of their blunted HVR and widened alveolar-to-arterial oxygen difference(1), which might augment the inhibition of transport (10). On the other hand, increased levels of catecholamines were reported in individuals suffering from HAPE (7). Since catecholamines potently activate fluid reabsorption in the lung, increased levels might to some extent compensate for the decreased basal transport activity. β-adrenergic agents have been shown to be effective in acute pulmonary edema (3). However, it has not yet been demonstrated that these agents can be used to prevent or treat HAPE.

The results on ion transport across the alveolar epithelium indicate clearly the important role in fluid clearance from the alveolar space. However, it is impossible to state the significance of this mechanisms in maintaining the fluid balance in the lung in hypoxia relative to the effects of pulmonary hypertension and to changes in permeability. It can be assumed that the "liquid pump" (3) described above is important as long as the epithelium is intact, but that it looses its significance with increasing leakiness.

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1. **Bärtsch, P.** High altitude pulmonary edema. *Respiration* 64: 435-443, 1997.
2. **Bärtsch, P., M. Maggiorini, M. Ritter, C. Noti, P. Vock, and O. Oelz.** Prevention of high-altitude pulmonary edema by nifedipine [see comments]. *N.Engl.J.Med.* 325: 1284-1289, 1991.
3. **Barker, P.M.** Transalveolar Na^+ absorption - A strategy to counter alveolar flooding? *Amer.J.Respir.Crit.Care Med.* 150: 302-303, 1994.
4. **Cheek, J.M., M.J. Evans, and E.D. Crandall.** Type I cell-like morphology in tight alveolar epithelial monolayers. *Exp.Cell Res.* 184: 375-387, 1989.
5. **Cheek, J.M., K.J. Kim, and E.D. Crandall.** Tight monolayers of rat alveolar epithelial cells: bioelectric properties and active sodium transport. *Am.J.Physiol.* 256 (Cell 25): C688-C693, 1989.
6. **Guery, R.P.H., C.M. Mason, E.P. Dobard, G. Beaucaire, W.R. Summer, and S. Nelson.** Keratinocyte growth factor increases transalveolar sodium reabsorption in normal and injured rat lungs. *Amer.J.Respir.Crit.Care Med.* 155: 1777-1784, 1997.
7. **Hultgren, H. N.** High altitude medicine. 1997. Stanford, CA, Hultgreen Publications.
8. **Hummler, E., P. Barker, J. Gatzy, F. Beermann, C. Verdumo, R. Boucher, and B.C. Rossier.** Early death due to defective neonatal lung liquid clearance in α-ENaC-deficient mice. *Nature Genet.* 13: 325-328, 1996.
9. **Mairbäurl, H., R. Wodopia, and P. Bärtsch.** Effects of hypoxia and calcium on alveolar ion transport. *Eur.Resp.J.* 10: 134s, 1997.
10. **Mairbäurl, H., R. Wodopia, S. Eckes, S. Schulz, and P. Bärtsch.** Impairment of cation transport in A549 cells and rat alveolar epithelial cells by hypoxia. *Amer.J.Physiol-Lung.Cell M.Ph.* 273 (17): L797-L806, 1997.
11. **Matalon, S., D.J. Benos, and R.M. Jackson.** Biophysical and molecular properties of amiloride- inhibitable Na^+ channels in alveolar epithelial cells. *Amer.J.Physiol.Lung Cell M.Ph.* 15: L1-L22, 1996.
12. **Matthay, M.A., H.G. Folkesson, and A.S. Verkman.** Salt and water transport across alveolar and distal airway epithelia in the adult lung. *Amer.J.Physiol.Lung Cell M.Ph.* 14: L487-L503, 1996.
13. **Matthay, M.A. and J.P. Wiener-Kronish.** Intact epithelial barrier function is critical for the resolution of alveolar edema in humans. *Am.Rev.Respir.Dis.* 142: 1250-1257, 1990.
14. **O'Brodovich, H.** Epithelial ion transport in the fetal and perinatal lung. *Am.J.Physiol.* 261: C555-C564, 1991.
15. **Pitkanen, O., A.K. Tanswell, G. Downey, and H. O'Brodovich.** Increased PO_2 alters the bioelectric properties of fetal distal lung epithelium. *Amer.J.Physiol.Lung Cell M.Ph.* 14: L1060-L1066, 1996.
16. **Planes, C., B. Escoubet, M. BlotChabaud, G. Friedlander, N. Farman, and C. Clerici.** Hypoxia downregulates expression and activity of epithelial sodium channels in rat alveolar epithelial cells. *Amer.J.Respir.Cell Molec.Biol.* 17: 508-518, 1997.
17. **Planes, C., G. Friedlander, A. Loiseau, C. Amiel, and C. Clerici.** Inhibition of Na-K-ATPase activity after prolonged hypoxia in an alveolar epithelial cell line. *Amer.J.Physiol.Lung Cell M.Ph.* 15: L70-L78, 1996.
18. **Saumon, G. and G. Basset.** Electrolyte and fluid transport across the mature alveolar epithelium. *J.Appl.Physiol.* 74: 1-15, 1993.
19. **Semenza, G.L.** Regulation of erythropoietin production. New insights into molecular mechanisms of oxygen homeostasis. *Hematol.Oncol.Clin.N.Amer.* 8: 863-864, 1994.
20. **Weir, E.K. and S.L. Archer.** The mechanism of acute hypoxic pulmonary vasoconstriction: The tale of two channels. *FASEB J.* 9: 183-189, 1995.

TREATMENT OF MOUNTAIN SICKNESS WITH A STATIONARY HYPERBARIC CHAMBER

Introduction

Kumtor gold mine is located at 3800-4200m above sea level in Kyrgyz Republic, Central Tien-Shan.

Kumtor mine was not developed during the Soviet Era in view of the many problems related to high altitude mining. Acute Mountain Sickness (AMS) is the most common medical problem at Kumtor (1,2). A previous study of AMS incidence at Kumtor mine site (3800-4200 M) that was done among workers of the Soviet geological team (1988-1989) revealed AMS in 52.5% of workers.

Treatment of AMS

Treatment of AMS is fully described in high altitude medical articles. AMS and more severe manifestations of altitude illness (HACE and HAPE) are managed by treatment with oxygen, descent, dexamethasone and nifedipine (3, 4). Nevertheless there are some new trends towards prophylactic and treatment of AMS. They are:

1.Oxygenation of the living quarters. There are studies describing oxygen enrichment of the room air up to 28% on altitude. Examples include a few mines and telescope facilities in Chile.

Oxygen may be utilized by means of liquid oxygen supply or use of oxygen concentrators (5, 6, 7).

2.Using hyperbaric chamber with ambient air has been known for many years among climbers. They use portable hyperbaric chambers, which are bags inflated by foot pump, eg. Gamow Bag (8). This system is effective and reliable, but cannot be used among big populations. For example: at Kumtor, the workforce increased substantially from about 1,500 employees in early 1996 to more than 2,300 as the project reached peak construction (9).

Since January 1998 we have been using a stationary multiplace hyperbaric chamber (10) with ambient air (fabricator: Southern Oceanics, South Africa). Hyperbaric treatment has been known for years in surgery, aviation and diving medicine. Our search in the literature revealed no references using *stationary multiplace hyperbaric chambers (SMHC)* for the treatment of AMS. With hyperbaric treatment we can artificially reduce the

altitude down to sea level. This enables us to treat most of the effects of altitude exposure, therefore minimizing the need for evacuation of a patient to a lower altitude. Our data shows improve in the results of treatment of AMS and decrease of number of AMS related evacuations from mine site.

Brief technical description:

SMHC looks like a big fenestrated steel container with 4 electrical compressors. There are 6 stationary beds, chair and desk. The patient is able to move, do office work and communicate through intercom with medical personnel. All monitoring equipment is also available inside (ECG, breathalyzer, etc). Altimeter and manometer on the front panel show altitude and pressure inside the chamber. We set intake flow to 200 L/min, and maintain pressure by regulating the outflow valve to desired level.

Exhaust valve starts automatically as soon as excessive pressure builds up to 400 mbar.

The patient is monitored constantly. Table 1 shows pressures/altitudes ratio inside the SMHC. To prevent patient from AMS recurrence we descend the patient to an intermediate level before discharge.

Table 1: Useful Pressures/Altitudes

sea level	360 mbar
2000 ft	290 mbar
4000 ft	225 mbar (intermediate level)
6000 ft	160 mbar
8000 ft	100 mbar

Treatment protocol.

We evaluated treatment protocols of 72 pts (both sexes, aged from 22 to 55 yrs) with AMS at Kumtor mine site. Protocol included routine check of vital functions (eg. blood pressure check, pulse rate and oximetry, respiration rate, CBC, ECG) and Lake-Louise Self Assessment Questionnaire (11).

The average session time was 4 hours. The follow-up of patients after 12 and 24 hours was done.

All patients were divided into 3 categories, based on prevalence of certain symptoms:

1. AMS (general: poor sleep, fatigue, no appetite, headache) - 47 pts
2. HAPE (respiratory) - 16 pts.
3. HACE (cerebral) - 9 pts.

Second and third group basically included patients with clinical signs of high altitude pulmonary and cerebral edema respectively.

We realize that using a hyperbaric chamber is not a new mode of treatment, we have just applied old principles to a modern technique. Anyway, I would be interested to hear other peoples opinion of using stationary multiplace hyperbaric chamber for treatment of AMS.

My particular interest is emergency care (EC) at high altitude mines. Using this opportunity in publishing at the ISMM newsletter I would like to request everybody, who involved in EC to send me their statistics on emergency care at high altitude mines in the world.

Clinical results and discussion:

1. Complete recovery from AMS - 57 patients.
2. Recurrent AMS after 6 to 12 hours - 9 patients, mostly with neurological manifestation: headache, dizziness etc. These patients received additional treatment with acetozolamide, oxygen, decadron and pain medications.
3. No effect of treatment - 6 patients, all with HAPE (high altitude pulmonary edema confirmed on chest X-ray and ECG). Patients were pressurized in the chamber to sea level with excellent results after 5 to 10 hours stay, but rapidly deteriorated after release.

In terms of side effects, patients have been complaining of temporary ear pain, so they are now educated about equilisation to relieve it. We did not see side effects such as otic barotrauma, excessive carbon dioxide exposure or pulmonary hyperexpansion. No patients had claustrophobia.

Medical evacuations (ME) from mine site.

The main referral center from the mine site is about 6 hours drive by Ambulance. With implementation of the hyperbaric chamber in early 1998 ME were reduced by 50%. In comparison with the last year (12) the ratio of ME/AMS was 87/17 and 57/8 respectively.

Summary

AMS is common problem at altitude. Factors responsible for AMS are: rapid ascent, increased physical activity, congenital absence of right pulmonary artery etc. The illness is managed by treatment with oxygen, descent, dexamethasone and nifedipine. In addition to these methods we also have been using stationary multiplace hyperbaric chamber (SMHC). With SMHC we treat most of the effects of altitude exposure, therefore minimizing the need for evacuation of a patient to a lower altitude.

The treatment itself is harmless, as no artificial gases or chemicals are added. Patients can be assured that they can exit from the chamber at any time if they so wish. There is no maximum time limit for treatment.

Hyperbaric treatment has been a very helpful treatment of AMS and for temporary stabilizing condition of patients with HAPE, when descent is not immediately possible, for instance in poor weather/ road/ transport conditions.

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1. Le Roux J.M., Brimkulov N.N. Medical Service at Kumtor Mine Site. In: Abstracts of the Second World Congress on High Altitude Medicine and Physiology, Sept 24-27, 1996, Cusco, Peru. 86-87 (Acta Andina, Special Issue, vol.V, n.2, 1996).
2. Ashirbaev A.A., Arstanbekova G.A. Recent data on morbidity rate on Kumtor mine site (3800- 4200 m, Kyrgyz Republic, Central Asia). In: Abstracts of the 3rd World Congress on Mountain Medicine and High Altitude Physiology. 20-24th, 1998, Matsumoto, Japan, 105.
3. Hackett P.H., Roach R.C. High altitude medicine. In:Auerbach P.S. eds. Wilderness Medicine; Missouri: Mosby 1995: 18-26
4. Jacobson N.D. Acute high altitude illness. AFP, vol. 38, n.3, Sept. 1988, 135-1445. West J.B. Oxygen enrichment of room air to relieve the hypoxia of high altitude. Respiration Physiology 99 (1995) 225-232.
6. West J.B. Medical aspects of proposed telescope facilities at 5000 M in the Andes. In: Abstracts of the 2nd World Congress of High Altitude Medicine and Physiology, Sept. 24-27, 1996, Cusco, Peru, 78-79 (Acta Andina, Special Issue, vol.V, n.2, 1996).
7. West J.B. Commuting to high altitude:value of oxygen enrichment of room air. In: Abstracts of the 3rd World Congress on Mountain Medicine and High Altitude Physiology. 20-24th, 1998, Matsumoto, Japan, 7.
8. Pollard A.J., Murdoch D.R. The high altitude medicine handbook. Oxford: Radcliffe Medical Press, 1997: 19-219.
9. Annual Report 1996, Cameco Corp. 2121-11 West Str., Saskatoon, SK Canada S7M 1J3.
10. Ashirbaev A.A., Le Roux J.M., Arstanbekova G.A. The hyperbaric chamber facilities for treatment acute mountain sickness at Kumtor mine site (H=3800-4200M, Central Tien Shan). In: Abstracts of the 1st International Congress of Cardiologists of Turkish-speaking countries. Sept. 24-25, 1998, 133 (Central Asian Medical Journal, vol. IV, 1998, Supplement).
11. The Lake Louise Consensus on the definition and quantification of altitude illness. In: Sutton J.R., Coates G., Houston C.S. eds. Hypoxia and mountain medicine. Oxford: Pergamon Press, Advances in the biosciences, volume 84, 1992: 327-330
12. Ashirbaev A.A., Arstanbekova G.A., Le Roux, J. P. p.104, Statistical survey of medical evacuations (ME) from Kumtor mine site (3800-4200 m above sea level). In: Abstracts of the Third World Congress on Mountain Medicine and High Altitude Physiology. May 20-24th, 1998, Matsumoto, Japan, 10

OVERUSE FINGER AND JOINT INJURIES OF ADOLESCENT COMPETITION CLIMBERS - STATEMENT OF MEDCOM UIAA

Until today, no systematic medical data exists about injuries and overuse problems of adolescent competition climbers. There is only one publication by the Austrian Thomas Hochholzer (1997) showing 5 cases of partial epiphysiolysis of the PIP-joint in adolescent sport climbers.

ACTUAL STUDY:
In November 1997 a study involving all adolescent (13-15 years) Swiss climbing competitors has been started by the National Institut of Sport. Clinical and X-ray examination of all participants will be done. This study is still going on. Up to today, the intermediate results have not given evidence of severe clinical and/or radiological pathology. The definite results about overuse and X-ray pathology are not yet available.

ACTUAL RECOMENDATIONS OF MEDCOM UIAA:
Regarding the intermediate results of the above mentioned study for the time being, **there are no medical arguments for changing the minimal age limits for international climbing competition events at the time being for juniors: 14 years and for worldcup and masters: 16 years.**
For prevention, optimal supervision of the training by coaches and sport doctors is necessary. Overuse injuries of the finger joints, tendons and ligaments have to be recognized and treated as early as possible. Alternative training schedules have to be set up if this occurs.
The selection and construction of difficult routes with ergonomic holds prevents overuse injuries and minimizes the risks of longterm pathology.
The MedCom working group welcomes expert advice by medical doctors experienced in the field of sport-climbing pathology: Please contact the chairman of the working group directly:

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April 4, 1998

PEOPLE WITH PRE-EXISTING CONDITIONS GOING TO THE MOUNTAINS

Official guidelines of the UIAA Medical Commission (Vol 7)

Introduction

This paper is intended for doctors and interested non-medical persons but was not originally written for mountain medicine experts.

As more and more people are taking holidays at altitude, many of them are elderly, there are going to be a number suffering from chronic medical conditions. How should they be advised?

Effect of altitude and the mountain environment.

At altitude the low barometric pressure means that the oxygen inhaled is at a lower pressure than at sea level. This in turn means that the oxygen transport system of the body is operating under difficulties and any chronic condition which effects this system will make matters worse. Thus diseases of the cardio-respiratory system are especially likely to interfere with performance at altitude.

Apart from the effect of altitude itself, the mountain environment poses other hazards. The great ranges are situated mostly in under-developed countries and in wilderness areas where gastro-intestinal problems are common and medical help uncertain. Altitude holidays usually involve quite strenuous exercise and put a strain on the joints, especially knees, hips and backs. Finally the different culture and life style of such a holiday may impose psychological stresses which may be too much for some people unused to the difficulties and privations of such a trip.

There is also the consideration that on an expedition or trek the aphorism, "No man is an island" applies with greater force than in normal urban life. One member's illness affects the whole team and may even imperil the safety of other members. Therefore it is ethically imperative that if a person knows he/she has some pre-existing condition which might affect his performance, he should make it known, at least to the leader or medical officer if there is one.

Specific conditions.
A few of the commonest conditions are discussed here. Further reading is suggested at the end of the paper.

Respiratory
Conditions such as **chronic bronchitis, emphysema (COPD)** and other lung conditions which cause breathlessness at sea level are obviously going to cause even more shortness of breath at altitude. However **asthma** sufferers usually find they have less trouble at altitude. Although they may be breathing cold dry air, which can be a cause of bronchospasm, because of the absence of the allergens in the air at altitude, in the majority of cases, they have less wheeze. The increased sympathetic drive and adrenal steroid output may also help. They should, of course, take a good supply of their usual medication.

Cardiac conditions
Clearly patients with symptomatic heart conditions (e.g. **unstable angina, heart failure** etc.) should not go to high altitude, but patients with **systemic hypertension** controlled by medication seem not to be at increased risk nor do patients following successful **coronary bypass surgery** or **angioplasty** who have good performance at sea level. Patients with **angina** controlled by drugs should certainly consult their cardiologist before considering an altitude trip. The question of whether altitude is a risk factor in the aetiology of **coronary occlusion** in previously asymptomatic people, is unknown but the best evidence is that it is not a significant factor.

Blood disorders
Patients with **anaemia** will be more short of breath at altitude and some women may have low iron stores so would benefit from taking iron tablets when going to altitude. But for the majority of people these and vitamins are unnecessary. Patients with **bleeding** or **clotting problems** should not go to altitude. Although the effect of altitude on the clotting system is debated the remoteness from medical help is reason enough to advise caution. Similarly patients on **anti-coagulation therapy** for any reason should probably be advised to choose a holiday where medical help is readily available. Patients with **sickle cell disease** also should not go to altitude. Even with **sickle cell trait** there is a 2030% chance that altitudes above 2000 m may trigger a crisis. **Aspirin** is taken by a number of people going to high altitude with the idea of reducing any risk of thrombotic problems due to the high haematocrit of altitude. We have no evidence either way for this practice but the usual precautions in taking aspirin (or any NSAIDs) must be stressed.

Endocrine disorders

Diabetes mellitus
Altitude itself probably does not have any effect of diabetes and many diabetics have enjoyed holidays in the mountains. However the increased exercise is likely to reduce the insulin requirements and, if this is not allowed for, hypoglycemia is a risk. Both the patient and companions need to be aware of the risks of hypo- and hyperglycemia and know how to recognize and treat these problems in the absence of medical help.

Steroid therapy.
Patients who have been on steroid replacement therapy for adrenal failure, should increase their steroids on going to altitude to cover the increased requirement due to the stress of altitude.

Gastro-intestinal disorders

The commonest medical problems amongst trekkers are usually diarrhoeal disorders and anyone with a chronic pre-existing condition of this sort, e.g. **Crohn's or ulcerative colitis** should probably not plan this sort of holiday. Peptic ulcer should be treated before going into the high mountains. Similarly conditions such as **hemorrhoids, fissure in ano** etc. considered trivial at sea level can cause real problems in the mountains and need to be dealt with before the trip.

Neurological conditions
Migraine. Many migraine sufferers find that ascent to altitude triggers an attack, often a severe one with neurological symptoms. It can be difficult to distinguish this from AMS or even HAPE although the headache of AMS is not usually unilateral, as it is typically in migraine. Migraineurs should take a supply of the drugs that usually help them and use the drugs at the first

sign of an attack. If in doubt about the diagnosis, especially if symptoms persist after using drugs which normally relieve symptoms, the patient should be treated as for AMS or HACE.

Cerebro-vascular disorders.
Patients with known or suspected cerebro-vascular problems such as TIAs, previous strokes or carotid artery stenosis should probably be advised against altitude travel because of the risk of thrombosis with the high haematocrit.

Epilepsy.
Contrary to what might be expected, there is no evidence that altitude increases the risk of an epileptic seizure, so patients who's epilepsy is well controlled can enjoy holidays at altitude with the same confidence as would apply to hill walking at low altitude.

Joints and ligaments
A trek, particularly long down-hill sections, will reveal even slight weaknesses in weight bearing joins. Again this is not due to altitude itself and would-be trekkers can test themselves out at low altitude. Non-steroidal anti-inflammatory agents are valuable in this area and a good supply of various drugs should be taken. They should be started early (taken on a full stomach) and in adequate dosage rather than being heroic about the pain.

ENT and dental problems
Nasal polyps which interfere with breathing should be dealt with prior to the trip as should any outstanding dental problems. Dental abscesses seem to be very common at altitude, possibly as a reflection of reduced immune function. They can usually be kept under control by antibiotics until return home.

Mental outlook
For the majority of people venturing into the high mountains is a wonderful experience even if, at times, the conditions are harsh and uncomfortable. Most have graduated via family trips into the hills, short camping trips near home, hill walking etc. But some suddenly get the idea that they want to make some big trip with no previous experience and have quite unrealistic ideas of their own performance. Sometimes all works out well and they adapt to what is a very different life style with no problem but others are clearly psychologically quite unsuited to it and become psychiatric casualties, to the distress of themselves and their companions.

Summary
An account of this sort inevitably focuses on the gloomy side. Many people with chronic conditions can nevertheless enjoy holidays in the mountains. The important thing is to assess the situation realistically, take advice, be honest with oneself and one's companions and tailor the trip to one's abilities.

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Ward, MP, Milledge, JS and West, JW. (1995) High Altitude Medicine and Physiology 2nd Ed. Chapman & Hall, London p543-53.

Hultgren, H. (1997) High Altitude Medicine. Hultgren Publications, Stanford. p424-70.

Pollard, AJ and Murdoch, D. (1998) The High Altitude Handbook. 2nd Ed. Radcliffe Press. Abingdon. p67-73.

ARE ALTITIUDE OEDEMAS, COLD INJURIES, EXHAUSTION AND DEATH DURING RESCUE "ACCIDENTS" OR "ILLNESS"?

Results of a Multidisciplinary Working Group „The Definition of Mountain Accident“- of the Austrian Society for Mountain and Altitude Medicine.

In the past the definition of “*ACCIDENT”* on which the majority of accident insurance contracts are based, has proved inadequate for the assessment of alpine injury, and has therefore become highly controversial. The question as to whether occurrence of “Alpine Injuries”, such as: Altitude Edemas, Cold Injuries, Exhaustion as well as Death During Rescue, are to be classified as “accidents” or “illness”, has so far, for obvious reasons and in some specimen cases, led to rather one-sided interpretation by accident insurers.

The so called “Accident Perception”, as predominantly applied by insurance companies, reflects a purely arbitrary and unrealistic attempt at a definition which, in Austria for instance as well as in some other European countries, even lacks any legal basis. This crucial deficiency lies in the fact that it lacks any objective justification. It therefore appears to be not only controversial, but also technically incorrect. This is often a highly restrictive partial interpretation, and stands all too frequently in contradiction to the actual facts of the events.

The crucial questionable element of this customary “”Accident” perception seems to be practically untenable, and therefore an inadmissible demarkation between “illness” and “accident”. This arbitrary differentiation is not logically possible because these terms have so much in common that they *both* reflect occurrences that unexpectedly affect a person in variance with the normal course of events. Furthermore, arbitrary, artificially constructed and thus unrealistic interpretations of terms such as “causality”, “damage from outside” and “suddenness”, are being used.

The deficiency of this “accident” perception leads to considerable misunderstandings when entering into an insurance contract. It can be of vital importance particularly for those involved or for their surviving dependents if compensation is denied by insurance companies on the grounds of technically untenable arguments. Since this dilemma is quite obviously also based on misleading accident-specific and medical perceptions, it is high time to define, clearly and unmistakably, these terms, at least in the field of Alpine Accidents.

The Austrian Society for Mountain and Altitude Medicine is an internationally recognised body of experts. It has entrusted a multi-disciplinary working group consisting of experts in insurance matters, alpine law, as well as highly competent experts in alpine medicine with the thorough investigation of this matter and a clarification of the associated problems. In January 1998, following extensive work on this subject, this body reached the following ***conclusions:***

Altitude Edema, Cold Injuries, Exhaustion and Death during Rescue are, in the context of an "Extended Accident Perception", to be classified as "Alpine Accidents", if and when:

- ***injury occurs within an acceptable space of time, and as a direct result of external/third party causes;***
- ***and also, in an "alpine" context, uncommon disorders (such as hypothermia, hypoxia) coincide with exceptional unexpected situations e.g. loss of way, loss or failure of equipment, including thermal protection, unsuccessful rescue attempts, etc..***

From an alpine-technical and accident-medical point of view there will therefore be, in future, an urgent requirement for this clarification to be taken into consideration. This is not only with the compilation of insurance contracts but also for the assessment of evidence in connection with legal opinion on alpine injuries in the sense of an Extended Accident Perception.

There are already individual contracts with certain accident insurance companies that include this extended "Accident" perception, as defined above. When negotiating an accident insurance contract it will therefore be of vital importance to ensure the inclusion of relevant commitments in the "Terms and Conditions".

In future, no accident insurance contract should be entered into which does not explicitly confirm the "Extended Accident Perception". There is good reason for hope that due to the growing Europe-wide competition, even restrictive accident insurance companies will have to adapt their Terms and Conditions to conform to these new standards, so as not to face severe competitive disadvantage.

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INTERNATIONAL PORTER PROTECTION GROUP (IPPG)

On 7th September 1998, IPPG organized a Conference on Porter Safety in Kathmandu: Sixty people attended the conference including trekking agents (some of whom supported the conference financially), embassies, press and radio reporters, social activists, HRA (Himalayan Rescue Association), KEEP, etc. thus raising awareness of the issue. Among many points raised at the conference, one of great importance was that porters are just as susceptible to altitude illness as westerners, and more so to hypothermia and frostbite. They also are more likely to suffer from chronic illnesses (bronchitis, anemia, worm infestation, TB, etc). The Canadian Consul pointed out the dangers of too many "porter horror stories", especially on the Internet. There is a chance that it may become a "cause celebre" and result in a beat up, resulting in a collapse of the trekking industry. In which case, the porters would be out of work, which is definitely not a solution for them... This is what occurred with the carpet industry and child labor. One suggestion was that a "statue to the unknown porter" be erected to raise awareness of the porters who have died while carrying for treks and expeditions (comm. Doug Scott).

IPPG will hold another event next Sept/Oct. in Kathmandu.

As a consequence of the conference: Several articles appeared in the Nepali press. TAAN (Trekking Agents Association of Nepal) has been approached in writing to endorse the five basic guidelines on porter safety that IPPG advocates.

A suggestion made to them was they endorse the "happy porter" logo (i.e. trekking agencies may use the IPPG "happy porter" logo if they put their commitment to those five guidelines, in writing).

Other related activities that have happened this year: Last Christmas, the local reps of the Manang Rescue Fund organized a fundraiser in Manang itself (this fund is used to pay local people who have rescued porters in difficulty). "Death of a Porter" has been published in two British trekking/climbing magazines, which provoked discussion in the mail column.

Other IPPG activities on the way: Plans for a documentary on the life of a porter are under way. Himal magazine (South Asia) is doing a piece on IPPG and the conference. One immediate aim is to develop a home page and ultimately a web site devoted to this issue. If anyone of you has the time, energy and expertise to do this please let me know.

If anyone of you have any ideas, suggestions, etc. IPPG would very much like to hear them. IPPG can only make a change if we all work at it.

Jim Duff

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INCREASED POLYCYTHEMIA; ALLY OR FOE IN THE CONQUEST OF MOUNT EVEREST?

Bernardo Guarachi, 45 years old, has traversed the realms of history by being the first Bolivian to reach the Everest Summit.

But from the medical point of view, he has reached, in our opinion, a much higher significance. Bernardo is the best known mountain guide in Bolivia. He has summited Illimani (6490 m), 170 times and of course all the other important mountains in Bolivia and South America including Aconcagua, Chile (6959 m), with no supplementary oxygen. He is a descendant of the Aymaras and has made his conquest as a sole representative of Bolivia, with little funds, joining groups from other countries.

On his first attempt back in 1994, he had a normal hematocrit of 56% (average saturation of 92%) for 3510 m, but we noticed that he had small positive slope on the plateau of the single-breath nitrogen washout curve, because of uneven ventilation. On that occasion he did not reach Everest summit, but reached Mount Makalu without any supplementary oxygen.

Four years later, and four months prior to his second successful attempt on May 25, 1998, he had a hematocrit of 70% and an average saturation

of 90%. His many ascents (some even with flu), may have probably injured some alveolar areas of his lung. Life insurance was rejected because of the increased polycythemia. We told him that this polycythemia was a compensating mechanism to his mild pulmonary function alteration, as we sustain in our concept of chronic mountain sickness (CMS), and advised him not to spend a week in Berlin, Germany prior to ascent, as he had planned to attend a ITB gathering there. He could not avoid such compromise, but reduced his stay to two days. Nutrition with proteins and carbohydrates was instructed.

The ascent was troublesome. Ironically, he rented 3 tubes of oxygen but once on the mountain, he found out that two were _ full and one only _ full. Plus the Sherpa accompanying him also needed oxygen. He eventually went down to rent other tubes and he only used 1 liter/minute (our advice), on his climb from camp 4 to the south summit where he stayed 15 minutes with oxygen and due to lack of climbing equipment was unable to reach the top summit and returned to camp 4. On his way down, at 8500 m he took off the oxygen mask because he noticed that he was hyperventilating too much and felt better. He made a successful reascent with 1 liter per minute initially and raised to 2 liters near the summit on the next try. At the summit (8848 m), he took off his oxygen mask to place the Bolivian flag, and remained without it for about one hour (risky, we now think and it surprised us too), while the other 2 Singapore climbers kept them on. He holds two records (as we have been told) of fast ascent and descent the same day from summit to base camp and permanence without oxygen at the top, where he affirms he "breathed better without the oxygen mask". We don't know the specific type of mask used and we lack an explanation.

For us, Bernardo proves that increased polycythemia was indeed beneficial and an ally in tolerance to extreme hypoxia. It compensated for his mild uneven ventilation. A check-up two days after his return to La Paz, showed that his hematocrit was 62% (probably due to deficient nutrition, fundamentally on rice) and a chest x-rays with some fine nodular spots in both lungs. This observation, we feel is an important contribution to the concept that increased polycythemia, is a compensatory mechanism of adaptation of the organism with anatomical or functional impairment of the lung in a chronically hypoxic environment [1,2]. In the case of Bernardo with minimum impairment but significative increase of the polycythemia, due to the altitude effect. It further sends the message to those suffering from chronic mountain sickness at high altitude, not to fear their increased polycythemia, since it is beneficial for their residence at high altitude, provided their lung and/or heart disease is well taken care of.

Gustavo Zubieta (Sr) and Gustavo Zubieta (Jr.)

Permission from Bernardo Guarachi was received for publication of this article.

1. Zubieta-Castillo, G. & Zubieta-Calleja G (1996). New concepts on Chronic Mountain Sickness. Acta Andina, Vol 5:1 pp 3-7.
1. CMS in www.geocities.com\CapeCanaveral\6280.

APRIL CASE DISCUSSION

Case

A 25 year old Sherpa developed high altitude cerebral oedema at 5000m on the Mera La in Nepal whilst acting as a porter on a commercial trekking expedition. His illness was noticed by the trek leader and he was evacuated by helicopter and made a full recovery. As 'compensation' he has now been offered a place as a high altitude Sherpa on a commercial expedition to Mount Everest. You are the expedition doctor. What would you advise? What is the risk of a second attack of HACE? Whatever you advise, the Sherpa decides to climb because of the financial benefits of the job. What would you do?

Nawang Sherpa. USA

1. Nowadays, with the commercialization of trekking, anyone can become a “Sherpa”. Any Sherpa who is born in Khumbu and has been living there should be very well adapted to that altitude 5000m by the age of 25yrs unless he has got some physical problems so I think it is very importent to know his history.
2. Recently most of the lowlander Sherpas have been doing very well in climbing, with my personal knowledge the lowlander Sherps spend most of their time around Khumbu at their Sardar's (Trekking leader) house as a helper and that might be one reason that they are very well adapted to high altitude.
3. It would be good to know whether there is a history of URTI during the Mera trek.
4. Risk for second attack is still high.
5. I would not suggest that he should go above 5000m but he could try it with careful acclimatisation.
6. If it really is a problem with compensation and financial difficulties, then I would suggest that he becomes a helper at the base camp, because that is good for him and good for the expedition team

James Milledge, UK

The question here is, "What is the risk of recurrence of HACE?" It would be interesting to know the rest of his altitude history. Does he suffer from simple AMS on ascent or was this a one off? The impression is that whilst HAPE has a high recurrence predictability, in the case of AMS and probably HACE the predictability of recurrence is not so certain. That said, I am sure that this Sherpa is at a higher risk of HAPE than the average. Since

he is determined to go on this Everest expedition the important thing is to be on the look-out for the first signs of trouble and to warn the leader and sirdar of his vulnerability. They should avoid his being on his own or in a situation where early signs of HAPE might be overlooked.

Shigeru Masuyama, Japan
We know even highlanders develop AMS/HAPE/HACE. However, HACE at 5000m in healthy highlanders is rare. If the young Sherpa was born and grown up at altitude, he might have some chronic illness. If so, he should be examined and treated before trying extreme altitude.
In case of a lowland Sherpa, born and grown up at Kathmandu or lower, AMS/HAPE/HACE could be possible as frequently as in lowlander porters. In this case, he will not show good performance at high altitude.
When I was a Kangchenjunga expedition doctor, I made a medical check on the candidates of high altitude Sherpa and omitted one sick Sherpa who was suspected of having pulmonary tuberculosis. If I am a leader or a doctor of the expedition, I will tell the Sirdar, a Sherpa leader, to exclude him from high altitude Sherpa of this expedition. He will be able to work as BC staff such as a kitchen boy.

John Severinghaus, USA
HACE in a Sherpa. Literature suggests that HACE is not as likely to repeat with each ascent as is HAPE, and even that is not a dominant effect. As HACE may be related to hypoxically induced VEGF as step 1 of angiogenesis, it is worth noting that the expression of VEGF peaks at 1-2 days and then falls despite continued severe hypoxia (in rats). Slower ascent, less stressful work, less heavy lifting especially early in his climbing should help protect him. It is probably worth having oral dexamethasone to take at the first sign of AMS or HACE.

David Hillebrandt, UK
I was going to hit the papers and books to ensure that I got the correct up to date data on recurrence of HACE but why bother? You have all that data and the academics can comment on the basis of data. I will comment as a G.P. !
This is comparible with putting an E1 leader on a poorly protected E5 climb that gets harder as one gets higher. He falls 80ft up and is just held by a poor RP 6ft above the ground. As compensation for the shock you then offer him £1million to solo the full 120ft route. I would recommend that the person offering him the "compensation" be urgently referred to a psychiatrist. This shows a total lack of insight into cultural motivation to climb on commercial expeditions. As the expedition doctor on the trip I would feel it essential to "resign" since I would not personally want to climb at high altitude with a group of people with so little understanding of high altitude problems and so little empathy with the culture they are visiting. I would not only be worried for all their Sherpas safety but also for my own safety if I were with them. I would put the reasons for my resignation in writing and outline the medico legal (and more important ethical) obligations of an expedition doctor.
If this Sherpa genuinely wanted to go high again I would be happy to be with him on a non commercial trip where we could go at our own speed and turn round when we felt it sensible. I would educate him in the use of dexamethasone to "buy time " for descent (and nifedipine) and would carry it with me but not issue it to him in case he later used it to go high when he should be descending.
I have a horrible suspicion that this may also be based on a real case.

Ken Zafren, USA
HACE can recur, but many people have developed HACE and gone on to climb to high altitude later without problems. I would recommend a very conservative rate of ascent, initially. I would make sure that someone responsible monitors this Sherpa during the climb. I would be encourage him not to conceal symptoms for fear of being told to descend, and I would apply the same rules to him as to all climbers: do not ascend with any symptoms of AMS and descend immediately if he develops severe symptoms of AMS, especially altered consciousness or ataxia. I don't believe that there is any effective prophylaxis for HACE, although he could use acetazolamide to speed acclimatization. Dexamethasone should certainly be given in the event he develops HACE, but its use should not delay descent.

Buddha Basnyat, Nepal
The term Sherpa may be used loosely here meaning any porter and not necessarily an ethnic group which would make a difference here as our observations from the HRA aid post in the Khumbu indicate that non Sherpa porters are frequently seen in late stages of AMS ie in full blown HACE. There are several reasons: they do not want to talk about AMS for fear of losing their job and having to descend; they may be unaware of this disease entity altogether; some have been known to run up to base camp from Lukla in a day and present with full blown HACE, thinking that this entity (AMS) does not exist in the native, only in the tourist.
I would tell the trip doctor to keep close tabs on this "Sherpa" if he is going up again so that the doctor knows if he has initial symptoms of AMS for which descent and longer time for acclimatization will do the trick.
The ethnic Sherpa due to their hard work and resourcefulness have moved up the trekking and climbing heirarchy so that they no longer are load carrying porters but true mountain guides.

Robert Schoene, USA
Tough decision. Might let him go but limit his peak altitude. Would just hate to risk his getting caught up high in bad weather as his HACE is Evolving. Make him your sirdar so that he won't go high!

David Shlim, USA
1. Is the person in question actually an ethnic Sherpa? It has become confusing in recent years as

the term Sherpa refers to both an ethnic group and a position on trek. Whereas Sherpas tend to be relatively altitude-illness resistant, other ethnic groups, such as Tamang, Rai, Limbu, and Gurung get altitude illness just like foreigners. If he is not a Sherpa, the fact that he got apparent cerebral edema while ascending Mera La would not be too unusual, depending on the rate of ascent. If he flew into Lukla and ascended the Mera La the next day, many people get ill on that itinerary. If that were the case, it shouldn't necessarily disqualify him from future employment with a better acclimatization schedule.

If the person is a Sherpa, that is a bit more worrisome, although one would need to know the circumstances under which he got sick--had he been in Kathmandu for a number of weeks and then flew rapidly to altitude and carried a heavy load.

2. If the person is a Sherpa (or even if he is not), one would want to be extremely skeptical about the diagnosis. There have been many cases of "altitude illness" among porters that were not compatible with what we know of altitude illness. Some of these involve getting sick while descending after weeks at altitude, and others involve symptoms that were not compatible with AMS. So, again, before disqualifying this person from further altitude employment, one would need to find out exactly what happened. Don't misinterpret what I've said: porters do get altitude illness and they do die from altitude illness; it's just that, like with any other medical condition, one needs a careful history in order to be certain of the diagnosis.

John English, UK

The Sherpa's livelihood depends on portering he probably should risk it?

Peter Bartsch, Germany

To advise this Sherpa it would be important to know the exact circumstances, like history of previous exposures and rate of ascent when HACE occurred. This will give some information on the chances for a second episode. But a mountaineer that happens to be especially susceptible for HACE could give it a try if he strictly follow the golden rules for avoiding death from high altitude illneses. namely:

1. If you have any symptoms that do not disappear after a day of rest you must descend.
2. Never ascend with any symptoms to a higher altitude
3. Never move alone on the mountain.

I would give dexamethasone to be carried by the accompanying person for situations when descent is not possible due to environmental conditions. Of course, this is an advice for a normal team member. In the case of a high altitude Sherpa it is different because chances are big that he cannot do his job when sticking to these rules. I would not want employ him. If he goes anyhow he should at least take Diamox plus consider all the recommendations for the normal team member. I would not give him Dexamethasone for prevention but have the drug in reserve for treatment at high altitude in case additional oxygen is not available.

CORRESPONDENCE

Editor,

Soon after attending this past Summer's ISMM Congress on Mountain Medicine in Japan, I became interested in the possibility of starting a "new researchers" forum for the ISMM for students, resident physicians, or young scientists. As a physician-in-training myself, and living in the relatively flat central United States, I have found it difficult to find colleagues with similar interests in mountain medicine. It seems that the future of this specialty is based on increasing awareness in the scientific community, encouraging research by younger scientists, and the passing on of knowledge gained by those who have made the field of mountain medicine what it is today. Hopefully, an effort to address the concerns of those new to the field would benefit both the future and growth of mountain medicine. Exactly what form this could take, I don't know. The ISMM newsletter is an excellent resource for those in the field, and perhaps a section specific to younger researchers would be appropriate. Maybe sponsored fellowships for young researchers, a mentorship program, or soliciting research projects that could use help would be feasible. Perhaps, just providing contacts with those already established in the field who are willing to offer advice or guidance is enough. Nonetheless, I'd be interested in hearing if anyone thinks this idea would be filling a need. Also, suggestions or comments as to how it would be manifest are welcome.

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LATEST REFERENCES

Altitude Illness

Anand IS, Prasad BA, Chugh SS, Rao KR, Cornfield DN, Milla CE, Singh N, Singh S, Selvamurthy W. Effects of inhaled nitric oxide and oxygen in high-altitude pulmonary edema. Circulation 1998;98: 2441-2445

Bärtsch P. High altitude pulmonary edema. Med Sci Sports Exerc 1999;31(1 Suppl):S23-7

Hackett PH, Yarnell PR, Hill R, Reynard K, Heit J, McCormick J. High-altitude cerebral edema evaluated with magnetic resonance imaging - Clinical correlation and pathophysiology. JAMA 1998;280: 1920-1925

Imray CHE, Barnett NJ, Walsh S, Clarke T, Morgan J, Hale D, Hoar H, Mole D, Chesner I, Wright AD. Near-infrared spectroscopy in the assessment of cerebral oxygenation at high altitude. Wild Environ Med 1998;9:198-203

Maggiorini M, Muller A, Hofstetter D, Bartsch P, Oelz O. Assessment of acute mountain sickness by different score protocols in the Swiss Alps. Aviat Space Environ Med 1998;69: 1186-1192

Murdoch DR, Curry C. Acute mountain sickness in the Southern Alps of New Zealand. NZ Med J 1998;111: 168-169

Pilmanis AA, Olson RM, Fischer MD, Wiegman JF, Webb JT. Exercise-induced altitude decompression sickness. Aviat Space Environ Med 1999;70: 22-29

Roach RC, Greene ER, Schoene RB, Hackett PH. Arterial oxygen saturation for prediction of acute mountain sickness. Aviat Space Environ Med 1998;69: 1182-1185

Sand T, Nygaard O. Quantitative EEG in acute mountain sickness. Acata Neurol Scand 1998;98: 386-390

Selvamurthy W, Basu CK. High altitude maladies: recent trends in medical management. Int J Biometeorol 1998;42: 61-64

West JB, Mathieu-Costello O. Stress-induced injury of pulmonary capillaries. Proc Assoc Am Physicians 1998;110: 506-512

High Altitude Populations

Batyraliev TA, Kudaiberdieva GZ, Sodanbekova JK, Aikimbaev KS, Gunal Z, Birand A. Correlation of atrial natriuretic factor and renin-aldosterone system with chronic pulmonary hypertension among residents in a high altitude. Int J Angiol 1998;7:271-4

Beall CM, Almasy LA, Blangero J, Williams-Blangero S, Brittenham GM, Strohl KP, Decker MJ, Vargas E, Villena M, Soria R, Alarcon AM, Gonzales C. Percent of oxygen saturation of arterial hemoglobin among Bolivian Aymara at 3,900-4,000 m. Am J Phys Anthropol 1999;108: 41-51

Beall CM, Brittenham GM, Strohl KP, Blangero J, Williams-Blangero S, Goldstein MC, Decker MJ, Vargas E, Villena M, Soria R, Alarcon AM, Gonzales C. Hemoglobin concentration of high-altitude Tibetans and Bolivian Aymara. Am J Phys Anthropol. 1998;106:385-400

Bonfichi M, Bernardi L, Malcovati L, et al. Lifestyle influences hematological adaptation to high altitude in Himalayan native and western populations. Blood 1998;92(Suppl. 1): 12B-12B Suppl. 1

Cohen JE, Small C. Hypsographic demography: The distribution of human population by altitude. Proc Nat Acad Sci 1998;95: 14009-14014

Collins KJ. Physiological variation and adaptability in human populations. Ann Hum Biol 1999;26: 19-38

Comas D, Calafell F, Mateu E, Perez-Lezaun A, Bosch E, Martinez-Arias R, Clarimon J, Facchini F, Fiori G, Luiselli D, Pettener D, Bertranpetit J. Trading genes along the silk road: mtDNA sequences and the origin of central Asian populations. Am J Hum Genet 1998;63: 1824-1838

Hiles TS, James GD, Garruto RM. Relationship between respiratory viral infection, social organization and altitude among children and adolescents from Peru and New Guinea. Am J Hum Biol 1999;11: 114-115

Moore LG, Niermeyer S, Zamudio S. Human adaptation to high altitude: regional and life-cycle perspectives. Am J Phys Anthropol 1998;Suppl 27:25-64

Ramirez G, Bittle PA, Rosen R, Rabb H, Pineda D. High altitude living: Genetic and environmental adaptation. Aviat Space Environ Med 1999;70: 73-81

Weitz CA, Garruto RM. The relationship between pulmonary function and hematology among older Tibetans born and raised at high altitude in Qinghai Provence. Am J Hum Biol 1999;11: 133-133

Wiley AS. The ecology of low natural fertility in Ladakh. J Biosoc Sci 1998;30: 457-480

Cold Injury

Cattermole TJ. The epidemiology of cold injury in Antarctica. Aviat Space Environ Med 1999;70: 135-140

Greenwald D, Cooper B, Gottlieb L. An algorithm for early aggressive treatment of frostbite with limb salvage directed by triple-phase scanning. Plast Reconstructr Surg 1998;102: 1069-1074

Hanzlick R, Powell K, Toomey K. Hypothermia-related deaths - Georgia, January 1996 December 1997, and United States, 1979-1995. JAMA 1999;281: 124-125

Hashmi MA, Rashid M, Haleem A, Bokhari SA, Hussain T. Frostbite: epidemiology at high altitude in the Karakoram mountains. Ann R Coll Surg Engl 1998;80: 91-95

Kanzenbach TL, Dexter WW. Cold injuries - Protecting your patients from the dangers of hypothermia and frostbite. Postgrad Med 1999;105: 72-78

Nissen ER, Melchert PJ, Lewis EJ. A case of bullous frostbite following recreational snowmobiling. Cutis 1999;63: 21-23

Ozyazgan I, Tercan M, Bekerecioglu M, Melli M, Ustun H, Gunay GK. Defibrotide activity in experimental frostbite injury. Brit J Plast Surg 1998;51: 450-454

Ozyazgan I, Tercan M, Melli M, Bekerecioglu M, Ustun H, Gunay GK Eicosanoids and inflammatory cells in frostbitten tissue: prostacyclin, thromboxane, polymorphonuclear leukocytes, and mast cells. Plast Reconstr Surg 1998;101:1881-6

Pettit TM, Finger DR. Frostbite arthropathy. J Clin Rheumatol 1998;4: 316-318

Punja K, Graham M, Cartotto R. Continuous infusion of epidural morphine in frostbite. J Burn Care Rehabil 1998;19: 142-145

Robson MC. Microcirculatory studies of frostbite injury - Invited discussion. Ann Plast Surg 1998;40: 254-255

Schissel DJ, Barney DL, Keller R. Cold weather injuries in an Arctic environment. Mil Med 1998;163: 568-571

Zook N, Hussmann J, Brown R, Russell R, Kucan J, Roth A, Suchy H. Microcirculatory studies of frostbite injury. Ann Plast Surg 1998;40: 246-253

Miscellaneous

Abinader EG, Sharif DS, Goldhammer E. Effects of low altitude on exercise performance in patients with congestive heart failure after healing of acute myocardial infarction. Am J Cardiol 1999;83: 383-387

Abinader EG, Sharif D, Rauchfleich S, et al. Effect of low altitude (Dead Sea location) on exercise performance and wall motion in patients with coronary artery disease. Am J Cardiol 1999;83: 250-

Allemann Y, Sartori C, Pierre S, et al. High altitude Doppler-echocardiography estimation of systolic pulmonary artery pressure correlates well with its invasive measurement. Circulation 1998;98: 133-133

Anholm JD, Milne ENC, Stark P, Bourne JC, Friedman P. Radiographic evidence of interstitial pulmonary edema after exercise at altitude. J Appl Physiol 1999;86:503-9

Antezana AM, Antezana G, Aparicio O, Noriega I, Velarde FL, Richalet JP. Pulmonary hypertension in high-altitude chronic hypoxia: response to nifedipine. Eur Respir J 1998;12: 1181-1185

Basnyat B. Fatal grand mal seizure in a Dutch trekker. J Travel Med 1998;5:221-2

Becker HF, Piper AJ, Flynn WE, McNamara SG, Grunstein RR, Peter JH, Sullivan CE. Breathing during sleep in patients with nocturnal desaturation. Am J Respir Crit Care Med 1999;159: 112-118

Bernardi L, Passino C, Spadacini G, Calciati A, Robergs R, Greene R, Martignoni E, Anand I, Appenzeller O. Cardiovascular autonomic modulation and activity of carotid baroreceptors at altitude. Clin Sci 1998;95: 565-573

Braun B, Butterfield GE, Dominick SB, Zamudio S, McCullough RG, Rock PB, Moore LG. Women at altitude: changes in carbohydrate metabolism at 4,300-m elevation and across the menstrual cycle. J Appl Physiol 1998;85: 1966-1973

Brij SO, Peacock AJ. Cellular responses to hypoxia in the pulmonary circulation. Thorax 1998;53: 1075-1079

Celedon G, Gonzalez G, Sotomayor CP, Behn C. Membrane lipid diffusion and band 3 protein changes in human erythrocytes due to acute hypobaric hypoxia. Am J Physiol 1998;275:C1429-31

Fagan JM, Rex SE, Hayes-Licitra SA, Waxman L. L-arginine reduces right heart hypertrophy in hypoxia-induced pulmonary hypertension. Biochem Biophys Res Commun 1999;254: 100-103

Fanghanel G, Sanchez-Reyes L, Morales M, Torres E, Chavira J, Sotres D, Valles V. Comparative accuracy of glucose monitors. Arch Med Res 1998;29: 325-329

Frappell PB, Leon-Velarde F, Aguero L, Mortola JP. Response to cooling temperature in infants born at an altitude of 4,330 meters. Am J Respir Crit Care Med 1998;158: 1751-1756

Harvey J. Altitude training for improvements in sea-level performance of elite athletes. Sports Exerc Injury 1998;4: 124-127

Kleinman MT, Leaf DA, Kelly E, Caiozzo V, Osann K, O'Niell T. Urban angina in the mountains: Effects of carbon monoxide and mild hypoxemia on subjects with chronic stable angina. Arch Environ Health 1998;53: 388-397

Kohlendorfer U, Kiechl S, Sperl W. Living at high altitude and risk of sudden infant death syndrome. Arch Dis Child 1998;79: 506-509

Luks AM, van Melick H, Batarse RR, Powell FL, Grant I, West JB. Room oxygen enrichment improves sleep and subsequent day-time performance at high altitude. Resp Physiol 1998;113: 247-258

McNicholas WT. Arousal in the sleep apnoea syndrome: a mixed blessing? Eur Respir J 1998;12: 1239-1241

Nishihara F, Shimada H, Saito S. Rate pressure product and oxygen saturation in tourists at approximately 3000 m above sea level. Int Arch Occup Environ Health 1998;71: 520-524

Pandolf KB, Young AJ, Sawka MN, et al. Does erythrocyte infusion improve 3.2-km run performance at high altitude? Eur J Appl Physiol 1998;79: 1-6

Partovian C, Adnot S, Eddahibi S, Teiger E, Levame M, Dreyfus P, Raffestin B, Frelin C. Heart and lung VEGF mRNA expression in rats with monocrotaline- or hypoxia-induced pulmonary hypertension. Am J Physiol 1998;275:H1948-56

Resta TC, Chicoine LG, Omdahl JL, Walker BR. Maintained up-regulation of pulmonary eNOS gene and protein expression during recovery from chronic hypoxia. Am J Physiol 1999;276:H699-H708

Rigel DS, Rigel EG, Rigel AC. Effects of altitude and latitude on ambient UVB radiation. J Am Acad Dermatol 1999;40: 114-116

Rosenfeldt FL, Mariani JA, Ou RC, et al. Response of the human myocardium to hypoxia and ischemia declines with age - Correlation with increased mitochondrial DNA deletions. Ann NY Acad Sci 1998;854: 489-490

Severinghaus JW. Uses of high altitude for studies of effects of hypoxia. Adv Exp Med Biol 1998;454: 17-28

Sheikha A, El-Shehri M, Al-Janadi M, et al. Splenic syndrome in sickle cell trait patients at high altitude. Blood 1998;92: 34B-35B Part 2 Suppl. 1

Shephard PJ, Castellani JW, Shek PN. Immune deficits induced by strenuous exertion under adverse environmental conditions: Manifestations and countermeasures. Crit Rev Immunol 1998;18: 545-568

Skwarski KM, Morrison D, Barratt A, et al. Effects of hypoxia on renal hormonal balance in normal subjects and in patients with COPD. Resp Med 1998;92: 1331-1336

Stein P, White SE, Homan J, et al. Altered fetal cardiovascular responses to prolonged hypoxia after sinoaortic denervation. Am J Physiol 1999;I 45: R340-R346

Swenson ER. Carbonic anhydrase inhibitors and ventilation: a complex interplay of stimulation and suppression. Eur Respir J 1998;12: 1242-1247

Takagi M, Watanabe S. Two different components of contingent negative variation (CNV) and their relation to changes in reaction time under hypobaric hypoxic conditions. Aviat Space Environ Med 1999;70: 30-34

Tansley JG, Fatemian M, Howard LS, Poulin MJ, Robbins PA. Changes in respiratory control during and after 48 h of isocapnic and poikilocapnic hypoxia in humans. J Appl Physiol 1998;85: 2125-2134

Thron CD, Chen J, Leiter JC, Ou LC. Renovascular adaptive changes in chronic hypoxic polycythemia. Kidney Int 1998;54: 2014-2020

Tiernan CJ. Splenic crisis at high altitude in 2 white men with sickle cell trait. Ann Emerg Med 1999;33: 230-233

Vazquez-Garcia JC, Arellano-Vega SL, Regalado-Pineda J, Perez-Padilla JR. Normal ventilatory response to hypoxia and hypercapnia at an altitude of 2240 meters. Rev Invest Clin 1998;50: 323-329

Wagenaar M, Teppema L, Berkenbosch A, Olievier C, Folgering H. Effect of low-dose acetazolamide on the ventilatory CO_2 response during hypoxia in the anaesthetized cat. Eur Respir J 1998;12: 1271-1277

Weissmann N, Voswinckel R, Hardebusch T, Rosseau S, Ghofrani HA, Schermuly R, Seeger W, Grimminger F. Evidence for a role of protein kinase C in hypoxic pulmonary vasoconstriction. Am J Physiol 1999;276:L90-5

White MM, McCullough RE, Dyckes R, Robertson AD, Moore LG. Effects of pregnancy and chronic hypoxia on contractile responsiveness to alpha1-adrenergic stimulation. J Appl Physiol 1998;85: 2322-2329

Windle CM, Slaven GM, Macleod MA. Cerebral perfusion and psychometric testing after exposure to high altitude in the mountains. J R Nav Med Serv 1998;84:24-9

Woodhouse JI. A field evaluation of pulse oximetry in two arduous environments. J R Army Med Corps 1998;144:159-60

Zhang LB, Xiao DL, Bouslough DB. Long-term high-altitude hypoxia increases plasma nitrate levels in pregnant ewes and their fetuses. Am J Obstet Gynecol 1998;179: 1594-1598

BOOK REVIEW

Going Higher: Oxygen, Man and Mountains Charles Houston, The Mountaineers, Seattle, 1998. US$16.95

It was a great pleasure at Christmas to receive a copy of the new edition of Charles Houston's book on high altitude medicine and physiology. '*Going Higher: Oxygen, Man and Mountains'* began life in 1980 as '*Going Higher: the story of man and high altitude'*. This fourth edition is largely re-written and a useful new addition to add to the increasing array of books on the subject.

Houston's enthusiasm for mountains and the physiology of hypoxia shines through in his new edition. The advertising blurb that appears on the flyer about the book notes that Houston has been doing mountain medicine for "more than 50 years".....and he seems to be still doing it.

The book is divided into four sections: the atmosphere, basic respiratory physiology, mountain sickness and a chapter on prevention and treatment of altitude illness. There are 35 figures and 9 tables and a series of appendices provide a glossary, selected bibliography, and biographical data about historical figures. The book is well laid out with very good line drawings and photographs (black and white) throughout. My only criticism of the book design is that the cover is too flimsy. After a few train journeys travelling to London mine had already lost its shape.

Houston covers the most important topics concerning the physiology and medicine associated with altitude hypoxia, limiting himself to a discussion of the problem of oxygen lack rather than considering other aspects of mountain medicine in any detail. It is hard to find much that is missing from the text. Houston introduces historical figures from respiratory physiology and mountain medicine throughout and describes the 'Operation Everest' series of high altitude research studies in some detail. As a paediatrician, I was disappointed to find no serious consideration of children in the sections on acute mountain sickness or high altitude cerebral oedema since the problem of children at altitude is an increasing one. However, as the title suggests, this book is mainly concerned with mountaineering.

In the preface, Houston states that the book is directed at a wide audience, and, indeed, the language makes the text accessible to the educated lay person as well as the interested medical mountaineer. This is no easy task. Houston's book translates the dry physiology and medicine of high altitude hypoxia into a compelling narrative and his chatty style makes it a user-friendly text. One of my favourite lines (which sums up David Murdoch's article in the last edition of this Newsletter) says

".....there's a lot of wiggle room in defining "too high and too fast"."

There are now several books around which provide information about high altitude physiology. Houston's book will suit those who seek a 'down-to-earth' explanation about high altitude in plain language. With the increasing numbers going to high altitude regions of the world, the potential audience is huge. It is also a great undergraduate text for students from many different disciplines, including medicine, who are doing projects on high altitude, and need some background information. For the high altitude physiologist, '*Going higher'* will not replace the extensively referenced English language texts like Hultgren, or Ward Milledge & West or Heath & Williams but these three books have a small market and are not affordable or so accessible for the lay-enthusiast to dip into. At US$16.95, Going Higher is one of the better priced High Altitude books and represents excellent value.

If you want an easy-to-read, affordable book about altitude medicine and physiology, you will enjoy reading this one and might want to recommend it to your patients.

Andrew J Pollard ,UK

FORTHCOMING MEETINGS

6th International Society of Travel Medicine Conference: Montreal, June 6-11th 1999

Details from:
ISTM, PO Box 871089, Stone Mountain, Georgia 30087-0028 USA. Phone 770-736-7060, Fax 770-736-6732, email:
bcbistm@aol.com

World Congress III on Wilderness Medicine
Whistler, British Columbia (Canada) August 7-12, 1999

Details from: Dian Simpkins, Wilderness Medical Society 3595 East Fountain Blvd., Suite A-1, Colorado Springs, CO 80910 USA. Sponaored by the Wilderness Medical Society, ISMM and International Society for Trave; Medicine.
Phone 1.719.572.9255,
Fax 1.719.572.1514
e-mail: dian@wms.org

27th Annual meeting of the international society on oxygen transport to tissue 28th August-2nd September 1999

Details from:

Harold Swartz MD, President ISOTT, Center for the Study of viable systems, Dept. Diagnostic Radiology, Dartmouth Medical School, Hanover NH 03755
http://www.dartmouth.edu/~eprctr/isott99/firstann.html

4th World Congress on Mountain Medicine and High Altitude Physiology, Arica, Chile 1st-6th October 2000

Details from:
Claus Behn, Physiology and Biophysics, ICBM, Faculty of Medicine, University of Chile, Independencia 1027, Santiago, Chile Phone: 56-2-678-6215; Fax 56-2-777-6916; email cbehn@machi.med.uchile.cl

MOUNTAIN MEDICINE COURSE ADDRESSES

If you run a course and would like information included in ISMM News or if you have been on a course and would like to make comments about it please contact (updated February 1999):

Dr. Patrick Peters
E-mail: petersp@medinf.mu-luebeck.de
Complete new postal address/phone/fax/e-mail to be announced shortly

Address list of course organisers

Austria
Österreichische Gesellschaft für Alpin- und Höhenmedizin (ÖGAHM)
Univ.-Doz. Franz Berghold, Postfach, A-5710 Kaprun 130, Austria
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BOOKS OF INTEREST TO MEMBERS

There are a number of books available covering aspects of Mountain Medicine. If you are an author or publisher please send details of your book to the Editor for inclusion here.

Altitude Illness, Prevention and Treatment (Stephen Bezruchka, The Mountaineers, Seattle,1994), Mountaineers Books Details by fax from 1-206-223-6306 or phone:: 1-800-553-4453.email: mbooks@mountaineers.org
Going Higher: Man, Oxygen and Mountains (Charles Houston, The Mountaineers, 1999) Information from chouston@zoo.uvm.edu
High Altitude Medicine (Herb Hultgren, Hultgren Publications, 1997) Details by fax from: (415) 493 4225, or email: hultgren@highaltitudemedicine.com

High Altitude Medicine and Pathology (Donald Heath and David Williams, Oxford University Press, 1995). Details from email: drw@liverpool.ac.uk or fax ++44 151 706 5667

High Altitude Medicine and Physiology 2nd edition (Michael Ward, James Milledge and John West, Chapman and Hall Medical, 1995). Details by email from jmilledge@cix.compulink.co.uk

Hypoxia Symposia: The complete proceedings of the ten Hypoxia Symposia (1981-1997) are available on one CD. Email: studd@fhs.mcmaster.ca

The High Altitude Medicine Handbook 2nd edition (Andrew J Pollard and David R Murdoch, Radcliffe Medical Press, 1998, price £17.95). Details or Order from medical@radpress.win-uk.net or fax: ++44 1235 528830

High Life: A History of High-Altitude Physiology and Medicine (John B. West, Oxford University Press, 1998) $65.00, order 1-800-451-7556 US; 1-800-387-8020 Canada; fax 1-919-677-1303.

ANNOUNCEMENTS

Medical Expeditions

'*Medical Expeditions*' is a charitable company limited by guarantee. Its aim is to increase, by research and education, knowledge and awareness of altitude related illness.
'*Medex*' is a trading company set up to organise treks and expeditions in support of 'Medical Expeditions'. So far the following expeditions have been organised:
British Mount Everest Medical Expedition 1994 (BMEME)
Kangchenjunga 1998 (K98)
Expedition address for further information:
Pinfold, Hyssington, Montgomery, Powys SY15 6AY, UK
Tel. ++ 44 1588 620614
Fax ++ 44 1588 620160
Email medical_expeditions@compuserve.com.uk

Hypoxia Symposia:

The complete proceedings of the ten Hypoxia Symposia (1981-1997) are available on one CD. Email: studd@fhs.mcmaster.ca
Sharron Studd, Division of Continuing education, McMaster University, 1200 Main St West, Hamilton, Ontario L8N 3Z5, Canada.

The John Sutton Fund

The John Sutton Fund for research and education in hypoxia and mountain medicine has been established to provide a scholarship for a junior researcher to attend the Hypoxia symposium, to provide a small annaul grant to the Hypoxia symposium, to fund a research project undertaken by a young investigator in the area of hypoxia.
Details from:
The John Sutton Fund, c/o McMaster University HSC, Room 1M7, 1200 Main St West, Hamilton, Ontario, Canada L8N 3Z5
Tel 905 525 9140 Ext. 22111, Fax 905 572 7099. Email Studd@fhs.mcmaster.ca

Bibliography of High Altitude Medicine and Physiology

Bibliography of High Altitude Medicine and Physiology The 1999 edition of the Bibliography of High Altitude Medicine and Physiology is now available. The Bibliography is based on citations hand selected from the libraries of Drs. Hackett, Roach, Houston and Richalet. The new version has been updated to contain over 6000 references germane to the broad field of high altitude medicine and physiology. And in 1999, the bibliography contains many citations with abstracts. One CD contains the bibliography in several formats, plus demonstration versions of some of the most popular bibliography management software programs. The included programs include demos of EndNote, Reference Manager and Procite. The Bibliography is provided in native format for each of those databases, and in text format. All databases and demo programs are for the PC, except for EndNote where a MacIntosh version is also provided. The cost is $75 US, plus shipping and handling ($5 North America, $10 International). The Bibliography may be ordered by writing to Dr. Rob Roach, BHAMP, Box 343, Montezuma, NM 87731, USA. Email: rroach@hypoxia.net. US orders by check or money order. International orders, please inquire.

ISMM WEBSITE

The homepage has moved to
http://www.medicine.mc.duke.edu/ismm

The site contains useful links to other relevant sites. The site has been transferred to Duke University, North Carolina, USA.

SUBMISSION OF ARTICLES

Articles covering all aspects of mountain medicine from the academic science of high altitude physiology to the practical management of altitude illness and from treatment issues in hypothermia to practical medicine in mountain rescue will be considered for publication in the newsletter. Articles submitted for publication must be in English and will be subject to editorial review by appropriate members of the editorial and advisory boards. To reduce administrative costs, submissions should be made by email or floppy disc in a Microsoft Word 97 compatible format, wherever possible. The editor will try to cope with other electronic formats also. Non-electronic submissions by fax or mail will also be considered from individuals who do not have access to a suitable computer. PLEASE DO NOT USE ANY AUTOMATIC REFERENCING SOFTWARE SUCH AS ENDNOTE OR REFERENCE MANAGER as this can interfere with the formatting of the newsletter. References should be in the style of the *latest references* section of this Newsletter on page 14.

Articles covering the following areas should be submitted to the editor at the address on the front cover:
1) Original articless on mountain medicine and physiology
2) State-of-the-art reviews
3) Case Histories which will be discussed by email by an interntional expert panel.
4) Management guidelines for debate.
5) Biographies, historical reviews and obituaries.
6) Book reviews of English language books on any aspect of mountain medicine.
7) Reports on international and local mountain medicine meetings and conferences.
8) Information about national societies, courses, future meetings and books of interest to ISMM members.
References for inclusion in the section on latest references should be sent to David Murdoch Email: murdo005@mc.duke.edu
AJP

MEMBERSHIP SUBSCRIPTIONS

Subscriptions are due on the 1st January each year. A single reminder will be sent to members who forget to pay on time and if fees are still not received by the membership secretary, membership of the society will cease. Where members have difficulty in paying their subscriptions, they may apply in writing to the President of the society for complimentary membership.

Please ensure that you complete the entire back page of the newsletter each January when you renew your subscription, so that we can be sure that we have your correct address. The coordination of newsletter production, is a complicated international process. Please let us know if you experience any problems.

INTERNATIONAL SOCIETY FOR MOUNTAIN MEDICINE
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There are several ways by which you can pay your membership fees: **1.** By credit card: please use the form below or **2.** Send a ***Euro***check (in Swiss Francs) in favour of the ISMM directly to the Membership Secretary **3.** Give your bank the order to transfer the appropriate equivalent amount to our account: nr.CO-257.980.0, United Bank of Switzerland (UBS), CH-1211 Geneva 4, Switzerland. **4.** *Swiss* members can pay by postal check to PC 12-172-9 and mention the ISMM account number CO-257.980.0 at UBS. Renewal of membership is due on the 1st January each year. If fees are not received on time, membership will cease, after a single reminder.

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