Editorial

MEDICAL RESEARCH AT HIGH ALTITUDE

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It is a sad anomaly that despite having the largest number of residents at high altitude (HA) and the largest number of cases of HA illnesses, we still depend to a great extent on the authoritative work done in the West. Most of this work on the physiology and pathology at HA has been based on small numbers of sojourners to HA or volunteers exposed to simulated conditions for short periods. In the past there have been a few important contributions by service medical officers in India. The main stumbling block has been the absence of a permanent research establishment at HA. In order to correct this, the High Altitude Medical Research Centre (HAMRC) located within 153 GH in the Western Himalaya at an altitude of 3300m was set up in 1990, by the Defence Research and Development Organisation and the DGAFMS. This centre is equipped with state of the art equipment and allied facilities for research at HA. The only other similar research set-up at high altitude is the Arctic Institute at Mt Logan in the Canadian Rockies [1].

The problems that occur at HA have been well documented recently [2]. Despite the vast amount of material on HA available in Western literature, it is worth noting that the largest series on high altitude pulmonary oedema (HAPO) [3,4] and acute mountain sickness (AMS) [5] as well as the new entity of 'adult subacute mountain sickness' (SAMS) [6] have been described from India. Other works by our medical officers and specialists include the entity of high altitude pulmonary

hypertension [7,8], one of the earliest descriptions of high altitude cerebral oedema (HACO) [9], and the detection of chronic mountain sickness [10]. These important early observations are due to dedicated individuals working under difficult and primitive conditions. Significant contributions have also been made in the fields of HA and cold physiology by the Defence Institute of Physiology and Allied Science at Delhi.

Presently, a large number of our troops are serving for months to years at HA and many of them are deployed at extreme altitude (5500m) where, acclimatization is never complete. With more people being inducted to HA each year - civilians and service personnel - the problems of HA will keep increasing. In a 7-year survey, HA related illnesses accounted for 11.4% of all medical admissions while cold injuries were 14.5% of all surgical cases [2]. Though AMS is common at high altitude, HAPO is the commonest emergency accounting for over half the HA-related admissions (58.4%). HACO is the least common but most dangerous with a mortality of around 23% [2]. Extreme altitude poses additional problems such as venous and arterial thromboses and adult SAMS.

In the 3 years after HAMRC came into being a number of original studies have been carried out. An important conclusion of these has been the re-enforcement of the concept that the HA native of the Himalaya differs from his Andean counterpart by being genetically adapted to life at HA and not just acclimatized. The Himalayan HA native is thus

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similar to animals indigenous to HA [11,12]. Other studies include those on the physiology at extreme altitude [13,14] and the largest series on HAPO as well as trials on an indigenous version of one-man hyperbaric bag for treatment of HAPO (unpublished data).

Research at HA requires interest, dedication and physical fitness. HA physiology and pathology is the area where there are exciting possibilities for original work. Though much has been written about the illnesses of HA, more needs to be done. There are many lessons to be learnt when man meets mountains; and there are many questions which need answers if we are to understand the illnesses of HA better and succeed in our aim of preventing these problems. Some of the relevant questions are :

- a) What determines individual susceptibility to HAPO?
- b) What are the long-term effects of prolonged stay at extreme altitude?
- c) Is systemic hypertension at HA a fact or fiction?
- d) What are the possible ways of preventing these illnesses?
- e) Does a Himalayan native lose his immunity to the ill effects of HA if born and bred at sea level? If so, how long does it take for this to occur?
- f) Does altitude affect the pharmacokinetics and pharmacodynamics of drugs?
- g) Is immunity, particularly cell mediated immunity, altered at HA?

Besides the above questions there are other areas where much needs to be done. Retinal haemorrhages are a common asymptomatic finding at extreme altitude. A greater understanding of this could indicate how hypoxia alters vascular permeability. The possibility of hypoxia induced renal failure has also been proposed and this is another field requiring inquiry. The sinister cerebral oedema remains a mystery and many lives lost each year at HA could possibly have been saved if our knowledge of HA physiology was more complete.

We in the Armed Forces have always had

the requisite manpower and now the necessary facilities are available. We should make the utmost use of the two to be able to answer these questions and be recognised as authorities in the field of HA studies. It is also possible that the lesson learnt from these studies may have relevance in understanding patients suffering from diseases in which hypoxemia plays a role at sea level such as chronic obstructive airways diseases.

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