



SPECIAL ARTICLE

Antarctica from a Public Health Perspective

Dr. Pradip Malhotra

Abstract

This article analyses the health issues among the participants of different Indian Antarctic Expeditions from public health point of view and suggests some steps to reduce the health related issues and create better living conditions for the participants of Indian Antarctic Expeditions. were taken, based on it. It also links to various government efforts that now support this endeavour.

INTRODUCTION

About 165 million years ago Antarctica was joined to Africa, Australia, India, New Zealand and South America forming the supercontinent Gondwanaland¹. Forces within the Earth affecting the Lithosphere caused the Gondwanaland to rift & drift apart². Thirty million years ago the continents, as we know them today, reached their approximate present positions. Antarctica is a different planet on Earth. She is owned by nobody.

*** Formerly, Senior Regional Director of Health & Family Welfare, Kolkata,
Government of India, MoH&FW**

Member XXII Indian Scientific Expedition to Antarctica

Leader XXVIII Indian Scientific Expedition to Antarctica

Member 1st Indian South Pole Expedition

E-mail - pradip.malhotra@gmail.com

Mobile Phone No - 9830070096

‘Maitri’ India’s second permanent research base in Antarctica was built and finished in 1989, shortly before the first station Dakshin Gangotri was buried in ice and abandoned in 1990-91³. Maitri is situated on the rocky mountainous region called Schirmacher Oasis. The station has modern facilities to carry out research in various disciplines such as biology, earth sciences, glaciology, atmospheric sciences, meteorology, cold region engineering, communication, human physiology and medicine. It has a capacity to accommodate 25 persons in winter.

Health Issues

Contrary to common perception, disorders caused by exposure to cold, like frostbite and hypothermia, are rare in modern day Antarctic expeditions. This is primarily because of the scientific nature of the expeditions. Adventure activities are not encouraged in Indian Scientific Expedition to Antarctica (ISEA). All outdoor activities are centered around station maintenance and support to scientific activities. Clothing provided in ISEA is of Arctic grade and provides excellent protection against conditions prevalent in Antarctica. Comfortable living modules are available during outdoor traverses. Maitri’s location near sea level precludes any altitude related illnesses. Most of the health disorders in ISEA are mild. But occasionally serious problems might be encountered, which can test the mettle of any doctor. The common health issues encountered in ISEA in descending order of incidence are as follows:

1. Injuries – there are different types of injuries associated with
 - a. New surroundings, new habits and new compulsions of walking on ice after wearing snow shoes & Polar Dress.
 - b. Working with the heavy Polar Gloves is also a constrain.
 - c. Cold Injuries are more common during outdoor activities during Polar Night period.

- d. Excitement – sometimes participants fall down while trying to walk in a hurry on Blue Ice.
2. Dyspepsia and constipation – Dyspepsia & preponderance of GI tract disorders with a large number of cases of Amoebiasis & Amoebic Colitis can be substantially reduced by administering a course of Anti-Amoebic medicines to all participants before the start of expedition. Constipation is commonly attributed to less of water intake & pre-existing medical conditions. Usually people tend to drink less water to avoid going to the toilet which is more difficult exercise for the Summer Camp inhabitants.
3. Skin infections and allergies – Allergic Skin conditions are more common than infective skin conditions.
4. Vague headaches, pains and fevers – these are associated with ambient extreme cold climate.
5. Hypertension and other pre-existing diseases – Usually these run their own course as in mainland/homeland.
6. Psychological issues – these are basically related to deprivation of sensory stimuli
 - a. Lack of Sunlight—sensory perception
 - b. Extreme rough weather outside the station
 - c. Total lack of greenery or any other life form—visual perception
 - d. Lack of familiar sounds & noise—auditory perception
 - e. Lack of familiar smells—olfactory perception
 - f. Prolonged separation from their near & dear ones
 - g. Prolonged confinement inside the Station
 - h. Lack of any variety inside the station or outside
 - i. Gradual lack of topics of conversation
 - j. Comparative lack of any constructive work

- k. Relative lack of much communication with outside world
- l. Apprehensions and fears arising out of the situation
- m. Disturbances arising out of disruption of biological clock

7 Various eye problems due to exposure to glare of ice or during welding of equipments.

It has been observed that there is usually an increase in a number of cases of common cold & viral infection every time when new persons arrive on the station. This happens due to import of fresh viral & bacterial infection amongst people with subdued immunity. Later in a short period of 15-20 days it all subsides because the ambient climate in Antarctica (very low temperature & humidity) is not supportive for growth or sustenance of bacteria & viruses.

Water Management

- a. Method of procurement: At the Maitri Station from Priyadarshini Lake. The lake gets its annual feeding from the glacier about 300 metres behind Maitri by melting of ice during the peak summer months of November/December. In the camps: by melting of soft ice.
- b. Regular consumption of water at Maitri station is 2000 L/ day during winter and up to 5000 L/ day during summer. This water is pumped out regularly via a heated & insulated 255m long pipeline from Priyadarshini lake (Fig 1).



Photograph 1: Priyadarshini Lake & Pump house in front of Maitri Station

c. Chances of Pollution:

a. Potential Sources of contamination of Lake water:

- i. From limited number of Bird species available only during Summer months like Skua, Snow Petrel, Antarctic Terns.
- ii. From limited number of Penguins that might visit the station & its surroundings during Summer months.
- iii. Waste water from the Station (from Kitchen, Toilets, Bathrooms & scientific activities)

b. Chances of pollution are very low due to the quality of available water, ambient climate & simplicity of distribution system. As a signatory of International Treaty known as Madrid Protocol ⁴. ⁵which provides for comprehensive protection of the Antarctic environment and dependent and

associated ecosystems, we are supposed to maintain the environment of Antarctica as it is.

We keep on monitoring the quality of water available through various agencies who also keep a note of any Environmental Pollution caused by human & scientific activities at Maitri Station. Water is regularly tested for potability at Priyadarshini Lake as well as at the source of consumption in the station and till now the reports have been within normal limits.

All the waste water from the toilets, laundry & kitchen is passed through a Waste Water Treatment Plant (WWTP, diagram enclosed in Fig 2), before being discharged in to the Waste Water ponds on the western side of the station. Water at the discharge point in Waste Water Ponds is also regularly checked and is found to be within the prescribed range for the treated water to be discharged into inland surface water by Central Pollution Control Board (CPCB).

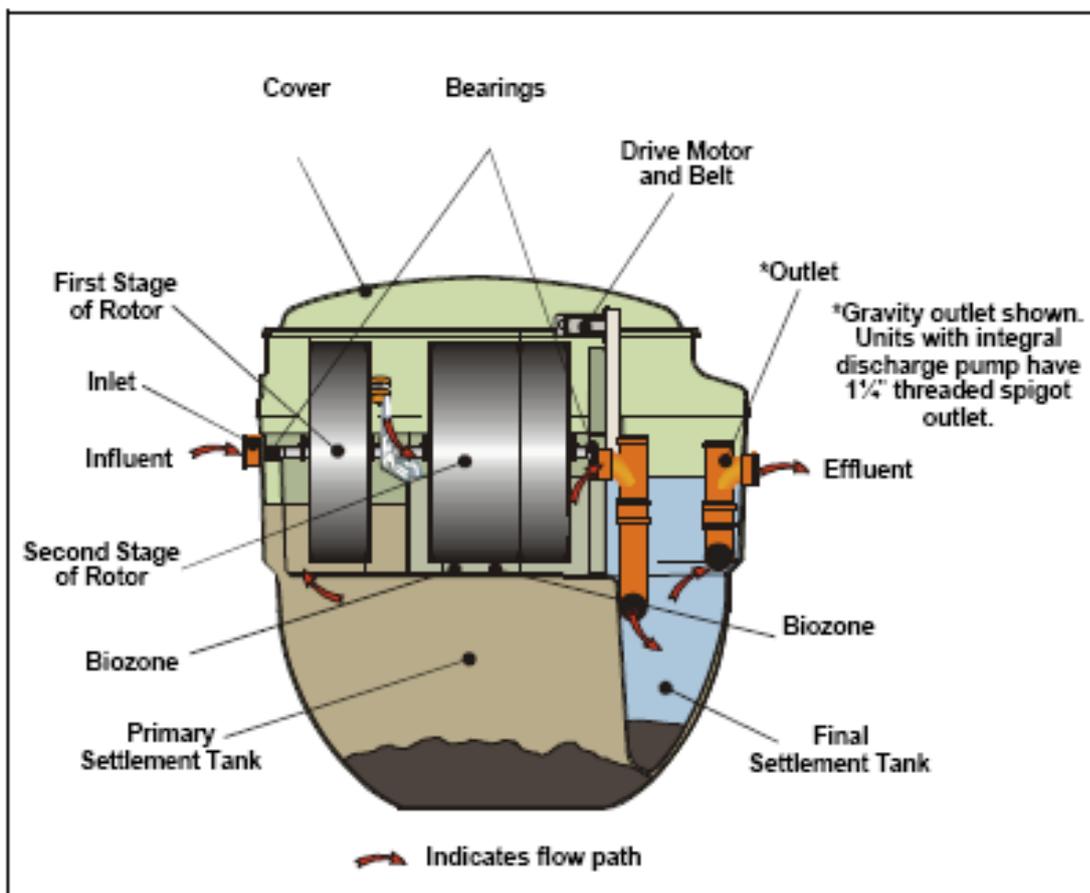


Fig-1: General view of wastewater treatment plant (WWTP) Unit (Bio-Disc System)

This is one peculiarity/specialty of Water Management in Antarctica. In all other places there are treatment plants before consumption to make it potable whereas in Antarctica it is treated after use to minimize the contamination & to retain the quality of water in the Priyadarshini lake in particular & the Antarctic ecosystem as a whole.)

Food

- b. a) Method of preparation
 - i. In the Station – Prepared by cook.
 - ii. In the convoys – Prepared from precooked & packed food by the participants.
 - iii. In the Camps – Prepared from precooked & packed food by the participants.
 - iv. During Helicopter sorties – High calorie food packets are carried by passengers as a backup supply in case of emergency situations
- c. Chances of contamination are only if the cook or any food handler has unhygienic habits or is a carrier of some GI diseases viz. Amoebiasis.
- d. A dose of Antiamoebic medicine to all participants just before the start of the expedition will be very helpful to reduce the incidences of GI disorders at our Antarctic Stations.

Ophthalmic disorders

It has been my personal experience and it has also been supported by various other medical reports ⁶ that our participants often suffer from eye disorders that arise from exposure of unprotected eye to the glare of the ice or of welding arcs. This can be easily be prevented by encouraging the regular & proper use of the right type of goggles that are supplied to each participant by Government of India.

Summary

It is quite interesting that water is treated all over the world before consumption to make it potable, whereas in Antarctica we treat the wastewater to retain the general indigenous quality & potability of water in Antarctica.

We can reduce the gastrointestinal health issues further than the present by the simple and in-expensive measures of administering one course of Anti-amoebic treatment to all participants just before the start of Antarctic Expeditions.

We must encourage the use of proper protection of the eyes from any type of glare by using the UV protective Sun Goggles issued to all participants.

Reference:

1. Suess E, Das A "Wir nennen es Gondwána-Land, nach der gemeinsamen alten Gondwána-Flora, ... " (We name it Gondwána-Land, after the common ancient flora of Gondwána ...): The Face of the Earth, (Leipzig, Germany: G. Freytag, 1885), vol. 1: p 768
2. Wegener A. The Origin of Continents and Oceans: Dover Earth Science Series, Dover Publications, 1966 Vol 361 .(pages?)
3. Ministry of Earth Sciences, GoI . National Centre for Antarctic & Ocean Research, Vasco, Goa., <http://www.ncaor.gov.in/antarctic> last accessed on 25th March 2016
4. Donald, Rothwell. The Antarctic Treaty System: Resource Development, Environmental Protection or Disintegration? The Arctic Journal 1990.
5. Greenpeace International 2011 "1991 - International Treaty saves the Antarctic from deadly threat" website :m. greenpeace.org. accessed on 25th March 2016

Malhotra P, Indian Antarctic Research in Medicine. Studies in Biological Sciences and Human Physiology, Three decades of Indian Scientific Activities in Antarctica; editors :Tripathy SC, Mishra RK, Mohan R and Khare N. National Centre for Antarctic & Ocean Research, Goa, India 2013, p 167-181