

Request by SCAR to the SSG Life Sciences and subsequently to the Expert Group on Human Biology and Medicine of the SSG-LS

In 2006 the Russian Federation submitted an Information Paper (IP 72) to the Antarctic Treaty Consultative Meeting in Edinburgh (United Kingdom), with the title 'Monitoring of pathogenic micro-biota in the Antarctic' (Annex 1).

SCAR was asked to comment on this paper, a request that was passed on to the SSG Life Sciences and subsequently to the Expert Group on Human Biology and Medicine of the SSG-LS.

The Expert Group tasked Dr. L. Reed and Dr. L. Palinkas with this and Dr. P. Convey was asked to assist when requested.

Summary of Key Points Made in Paper;

- The paper suggests that data exist to support a biological system which may be used as an indicator of changing influence of human exposure to Antarctica.
- The paper suggests that the change in biological elements such as fungi in the Antarctic could be harmful to both facilities and to humans who live in the Antarctic.
- The paper requests for increased use of the proposed biological methodology to screen for the proposed fungi as a marker of increased involvement of humans in the Antarctic.
- The paper requests for a way to monitor the disease processes as they appear clinically in humans.
- The paper requests that the monitoring and disease process monitoring occur on King George Island because of the increased interaction there of the many countries involved on King George Island.
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Issues with the Current Proposed Requests:

- The studies mentioned regarding the biological assay for microbiota and fungi are not cited in international literature or cited in any publication that can be retrieved for review. This creates an issue of assurance that the assay is valid and consistently reproduced and exactly which organisms are assayed. The assay is not described in the paper.
- The effect of these organisms upon humans is not well described and the literature supporting this concern is not cited. Earlier descriptions in the background of disease in the Antarctic relate to virus as "outbreaks" and these may much more readily relate to the host defense rather than any difference in the virus as a change in its pathogenicity.

- The proposed measures are very broad and include air, water, building materials, humans, and soil as measures for these biological assays.

Recommendations:

1. Consolidate the medical reports of the nations to include new respiratory illness or allergy symptoms that may be already included in the reports.
2. Ask the authors to specifically supply the biological assays used and the published literature to support the validity and reliability of the biological assays.
3. Ask the authors to specifically supply data linking the results of the biological assays to either human health or destruction of materials such as wood and plastics.
4. Review the issue when these new data elements have been resubmitted to the Expert Human Biology and Medicine Group.

PROPOSED STATEMENT REGARDING PRINCIPALS OF ETHICAL RESEARCH
IN THE ANTARCTIC

Specialty Group Life Sciences and Expert Group Human Biology and Medicine
July 10, 2006

Research conducted in Antarctica should comply with commonly accepted standards of participant informed consent and abiding by the Helsinki ethical guidelines (ref). This standard should include as a minimum, the review of the research protocol involving human subjects by an objective and unbiased body which will act as an ethical review of the protocol. This body would be similar to the National Ethics Committee of New Zealand, an Institutional Review Board in United States following the FDA _____ regulations, or the _____ Ethics Committee in the United Kingdom. This body would have the responsibility for the protection, safety and well being of the human subject involved with the research as well as the assurance that the subject has been informed of all risks and possible benefits of the research in accordance with the bodies listed above.

ANNEX 1

Monitoring of pathogenic micro-biota in the Antarctic

It is common knowledge that the Antarctic ecosystems are extremely sensitive to any external impact on the environment of their habitat. The increased protection of the ambient ecosystem of the Antarctic and the dependent and related ecosystems has become one of the main principles of the Protocol on the Environmental Protection to the Antarctic Treaty. The microbiological and medical studies of the extreme conditions of man habitat at the Antarctic stations and bases showed that the natural environmental background of this region was “sterile” to a great extent and did not contain the pathogenic species of microbes and viruses. The prolonged stay of man in the Antarctic strongly affected as a rule the immunity of his organism to the influence of different pathogenic microorganisms introduced to this region by the newly arriving personnel or the expedition property. This was resulting in the “outbreaks” of parainfluenza diseases among the expedition staff who worked under the isolated conditions of the Antarctic at the contact with “new” people. A prolonged man activity in some specific areas of the Antarctic makes him at present an active component of the environment, when not only man influences its characteristics, but the Antarctic environment itself affects to a great extent the state of man health. So the system of environmental monitoring makes it possible to use the medical-biological parameters of the human organism as its peculiar bio-indicator.

In this connection, such regions of the Antarctic where representatives of different countries and continents work and closely interact and where there is a significant intercontinental marine and air traffic should present the greatest interest for such kind of studies. Special place in this respect among the entire volume of the existing expedition Antarctic infrastructure belongs to King George Island. The stations of Chile, Russia, People’s Republic of China, Uruguay, South Korea, Brazil, Poland, Argentine and Peru operate the year-round and of Germany, the USA and Ecuador - during the seasonal period. Large volumes of the expedition cargoes of various nomenclatures are delivered to this island by ships and aircraft on a regular basis. The addresses of their dispatch are in different countries of the North and South America, Europe and South-East Asia. It is remarkable that according to data of the World Health Organization, the sources of different forms of viral diseases are registered almost annually exactly in the countries of South-East Asia. Therefore directly man and cargoes delivered to the Antarctic present possible carriers of viral infections.

Monitoring of microbiota of human settlements in the Antarctic in the residential and working zones of the stations and in their vicinity should be performed by the methods and devices of bio-indication and bio-testing. They give a comprehensive assessment of the environmental impact of all anthropogenic factors taking into account their complex (combined) impact and register it over a specific and often for quite a prolonged period of time. These methods allow us to compare different anthropogenic factors by the biological effect of impact and describe their total action including that on man. Many methods of the bio-indication monitoring do not require expensive equipment possessing high accuracy at this.

On the other hand, study of different microorganisms of the Antarctic, and in particular, of microscopic fungi (micromiceta) presents a practical interest due to the following reasons:

the structure of microbial community is a sensitive and integral indicator of the state of any ecosystem;

microbes and microscopic fungi determine the sanitary-epidemiological situation in the isolated man habitat at polar stations;

microscopic fungi colonized different anthropogenic substrates: oil products, timber, plastic materials, construction structures, etc.;

microbes and micromiceta, in particular, are strong bio-destructors.

In the process of investigating the microbiota of the living and working zones of the Antarctic bases and their vicinity it was shown that the development of the Antarctic is accompanied with intense invasion of microbial communities, the carrier of which is man himself. During the studies carried out by the Russian Antarctic Expedition in the seasons of 1998-99, 2002-03, 2003-04 and 2004-05, the anthropogenic changes of microbiota and the possibility of breeding and life activity of some pathogenic microorganisms under the extreme conditions at the Russian Antarctic stations and nearby stations and bases of other states were investigated. Of greatest interest appear to be the investigations made in the area of Bellingshausen station, located on King George Island during the seasons of 2002-03 and 2003-04. In the course of the analysis of the microbial diversity of the natural environment (air, soil and mountain rocks) samples of natural biocenoses were collected at a different distance from the Antarctic stations, and in the working and living zones. Sampling was performed in the vicinity of the stations of Russia, People's Republic of China, Chile, Uruguay, South Korea, Brazil and Czechia, several dozens of microscopic fungi belonging to different taxonomic and ecological groups were revealed. Such microbes were also detected within the premises abandoned by man a long time ago (field base of Czechia). The high content of the fungi spores in the air was recorded in the space of the Chinese and Brazilian stations and the Chilean station of bio-monitoring on Ardley Island. Some of these fungi species can be hazardous for man health.

The studies showed the formation of microbiota in the zone of activity of polar stations to be determined to a great extent by the anthropogenic impact on the fragile ecosystems of the Antarctic. Appearance in the air medium of the working and living zones of micromiceta, which have a high destructive activity and pronounced pathogenicity with respect to the human organism indicates the need for provision of constant control of the living and working premises, forming a closed man habitat. Moreover, the information was obtained about the intense processes of bio-destruction of materials and structures (goods) occurring in the infrastructure of the Antarctic stations (in living and working modules, in waterlines and transport vehicles), which sharply accelerates the processes of the natural ageing of technical facilities and decreases their life and reliability (serviceability period).

The studies showed a large practical significance of conducting such monitoring at different facilities of the national Antarctic programs both in terms of investigating the anthropogenic impact on the Antarctic environment, and the possible pathogenic influence of the microbial medium on man. Such investigations should be based in our opinion on common coordinated methodologies in different areas of practical man activity and especially in the closely located areas of activity of different national Antarctic programs. For greater efficiency these studies should be supplemented by systematic data on the morbidity of personnel of the stations of different nations.