

Polar Environment, Health and Safety GPRA Highlights, FY 2009

Influenza Outbreak Prevention

Highlight ID: 19171, Version: AC/GPA

For the 2008-09 season, NSF instituted a highly effective influenza vaccination program. All US Antarctic Program (USAP) participants were required either to show written proof of vaccination or receive inactivated influenza vaccine. During the 2007-08 season, at least 157 laboratory-confirmed cases of influenza occurred at McMurdo Station. No cases were detected at South Pole or Palmer Stations. Influenza illness resulted in an estimated incremental cost of \$227,434 in lost productivity and increased health care expenses, primarily for the purchase of antiviral medication (Tamiflu®).

For the 2008-09 season, only 2 laboratory-confirmed cases of influenza were reported at South Pole Station. No cases were reported at McMurdo or Palmer Stations. The impact on USAP operations was negligible. The new influenza vaccination program likely averted costly and disruptive infectious disease outbreaks in the USAP community during the 2008-09 austral summer season.

Primary Strategic Outcome Goal:

- Polar Facilities & Logistics

Secondary Strategic Outcome Goals:

In terms of intellectual merit, why is this outcome notable and/or important?

The program illustrates the application of sound public health principles in controlling an infectious disease outbreak in Antarctica.

In terms of broader impacts, why is this outcome notable and/or important?

[Merit Review Broader Impacts Criterion: Representative Activities, July 2007](#)

By addressing a significant infectious disease threat, NSF supported the needs of deployed members of the polar research community.

Does this highlight represent transformative or potentially transformative research? If so, please explain why. For more information, see [Report to Congress: Transformative Research at the National Science Foundation, April 16, 2008](#) and [Important Notice 130: Transformative Research](#)

No

How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc?)

No

What may be the benefits of the proposed activity to society?

No

OPP/PEHS 2009

Program Officer: Michael Montopoli

NSF Award Numbers:

NSF Contract Numbers:

0000373

NSF Investments: None Applicable

New Protocol Developed for High Altitude Acclimatization

Highlight ID: 19197, Version: AC/GPA

The Office of Polar Programs' Polar Environment, Health and Safety Office (PEHS) joined with the Antarctic Infrastructure and Logistics Division, Antarctic Science Division, and the Raytheon Polar Services Company to develop a high altitude acclimatization protocol that allowed researchers and support staff to efficiently move from sea level to work safely at 11,482 feet. The multinational team of scientists and support personnel from six nations planned to investigate the Gamburtsev mountain range under the East Antarctic Ice Sheet as one of the central projects of International Polar Year. Their work for the Antarctic Gamburtsev Province (AGAP) project required them to establish and live at two camps over 11,000 feet above sea level. The U.S. Antarctic Program was responsible for one of the camps, known as AGAP South.

The need to acclimatize the human body for working at high altitudes is well known, and acclimatization protocols exist for slow ascents to altitude. However, the distances between stations and camps in Antarctica require personnel to be flown from sea level to the 9,300 feet South Pole Station and then on to the AGAP South camp at 11,482 feet. The flights result in rapid changes in living altitudes not usually experienced by mountain climbers who approach their objectives on foot. Protocols for such rapid increases in living altitudes do not exist, and logistical considerations, the potentially serious consequences of altitude sickness, and the lack of sophisticated medical capabilities at the remote camp demanded that acclimatization be done right the first time and not overburden the already crowded South Pole Station.

PEHS and its partners developed a two phase protocol that required 72 hours at the Pole before flying to AGAP South, followed by another 72 hours of light duty before commencing the heavy work of setting up the camp and launching the survey aircraft. It also specified appropriate medications, activities, sleep schedules, and medical monitoring during the acclimatization period. During the 2008-09 Austral Summer season, over 50 persons made the trip from sea level to work at AGAP South without a single reported case of altitude sickness.

Primary Strategic Outcome Goal:

- Polar Facilities & Logistics

Secondary Strategic Outcome Goals:

In terms of intellectual merit, why is this outcome notable and/or important?

Although not intended to be a research project, the success of the new acclimatization protocol demonstrated a new strategy for moving personnel more efficiently to high altitudes. With minimal adjustments it will be used next season to accelerate the process of opening camps on the ice sheet so that research can be started with minimal delay.

In terms of broader impacts, why is this outcome notable and/or important?

[Merit Review Broader Impacts Criterion: Representative Activities, July 2007](#)

This acclimatization protocol reduces the risk, delay and expense of establishing camps on the high Antarctic ice sheet, effectively improving the utility of those essential elements of the Antarctic research infrastructure.

Does this highlight represent transformative or potentially transformative research? If so, please explain why. For more information, see [Report to Congress: Transformative Research at the National Science Foundation, April 16, 2008](#) and [Important Notice 130: Transformative Research](#)

No

How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc?)

No

What may be the benefits of the proposed activity to society?

Yes

While this project will not lead directly to appreciable societal benefits, it may indirectly contribute to research that does by making the research less expensive and more efficient.
OPP/PEHS 2009

Program Officer: James Karcher

NSF Award Numbers:

NSF Contract Numbers:

0000373

NSF Investments: International Polar Year (IPY)

Cumulative Impacts of Walking in Antarctica's Dry Valleys

Highlight ID: 19261, Version: AC/GPA

NSF-funded researchers working collaboratively from several different universities have uncovered yet another anthropogenic environmental impact in Antarctica, a continent which is becoming increasingly popular as a tourist destination and scientific research site.

Over a period of ten years, the researchers sampled soils in Taylor Valley within the McMurdo Dry Valleys region to determine the direct impact of foot paths in the area on soil life (Ayres et al., 2008). All sampling and measurements occurred on paths that were classified in three categories: highly trampled (50-80 walks a year), moderately trampled (10-15 walks a year), or undisturbed. Soil samples revealed three animal phyla, Rotifera, Tardigrada, and Nematoda, with two endemic species of nematodes (*Scottinema lindsayae* and *Eudorylaimus* sp.) as the most abundant fauna.

Overall, live *S. lindsayae* and *Eudorylaimus* sp. were reduced by 52% and 76%, over 10 years respectively, in areas of high trampling versus areas of low trampling. Differences were likely caused by increased mortality and/or reduced fecundity associated with human trampling effects.

Thus, even the low amount of foot traffic in this remote environment can impact the nematode population. Nematodes are the dominant metazoan in the Dry Valley soils and facilitate most of the carbon cycling in this habitat.

The results of this research, which deals with increasing human impacts in the Antarctic, were summarized and submitted for discussion within the Committee for Environmental Protection for the Antarctic Treaty Consultative Meeting, to be held in Baltimore, Maryland in April 2009.

Literature Cited

Ayres, E., Nkem, J.N., Wall, D.H., Adams, B.J., Barrett, J.E., Broos, E.J., Parsons, A.N., Powers, L.E., Simmons, B.L., & Virginia, R.A. (2008). Effects of Human Trampling on Populations of Soil Fauna in the McMurdo Dry Valleys, Antarctica. *Conservation Biology*, 22(6). 1544-1551.

Primary Strategic Outcome Goal:

- Polar Sciences: Arctic and Antarctic Research

Secondary Strategic Outcome Goals:

In terms of intellectual merit, why is this outcome notable and/or important?

The work is a striking example of biological research that links research findings with an investigation of impacts to the environment.

In terms of broader impacts, why is this outcome notable and/or important?

[Merit Review Broader Impacts Criterion: Representative Activities, July 2007](#)

This research addresses cumulative impact in a pristine dry desert environment in Antarctica, a site of worldwide interest.

Does this highlight represent transformative or potentially transformative research? If so, please explain why. For more information, see [Report to Congress: Transformative Research at the National Science Foundation, April 16, 2008](#) and [Important Notice 130: Transformative Research](#)

Yes

The research will promote new integrative investigations that link ecology, physiology, and human impacts in an area that is of great interest due to the global changes in the polar regions.

How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc?)

Yes

The research includes young investigators.

What may be the benefits of the proposed activity to society?

Yes

This research provides information critical to improving environmental stewardship in Antarctica, a goal of the Antarctic Treaty.

OPP/PEHS 2009

Program Officer: Polly Penhale

NSF Award Numbers:

[9810219](#)

Award Title: The Role of Natural Legacy on Ecosystem Structure and Function in a Polar Desert: The McMurdo Dry Valley LTER Program

PI: W. Berry Lyons, lyons.142@osu.edu

Institution Name: University of Alabama Tuscaloosa

State Code: AL

PE Codes: 7300, 5111

[0096250](#)

Award Title: The Role of Natural Legacy on Ecosystem Structure and Function in a Polar Desert: The McMurdo Dry Valley LTER Program

PI: W. Berry Lyons, lyons.142@osu.edu

Institution Name: Ohio State University Research Foundation

State Code: OH

PE Codes: 7300, 5979, 5112, 5111, 1128

[0406141](#)

Award Title: Synthesis of Soil Biodiversity and Ecosystem Functioning in Victoria Land, Antarctica: A Workshop; September 8-12, 2004; Jekyll Island, GA

PI: Diana Wall, diana@nrel.colostate.edu

Institution Name: Colorado State University

State Code: CO

PE Codes: 5111

NSF Contract Numbers:

Award or contract number required for submission.

NSF Investments: None Applicable