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LEVEL III

US Army Research Institute of Environmental Medicine

ANNUAL PROGRESS REPORT

Fiscal Year 1980

(1 October 1979 - 30 September 1980)

U S ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE

Natick, Massachusetts

1 October 1980

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UNITED STATES ARMY
MEDICAL RESEARCH & DEVELOPMENT COMMAND

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US ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE

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ANNUAL PROGRESS ~~REPORT~~

FISCAL YEAR 1980

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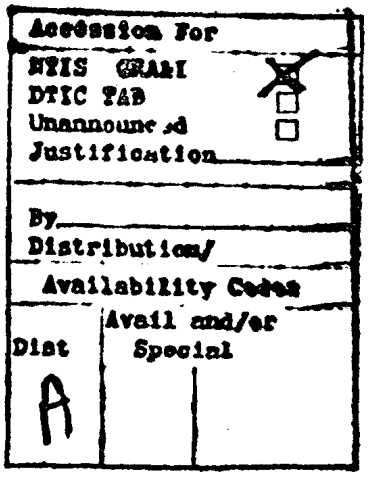

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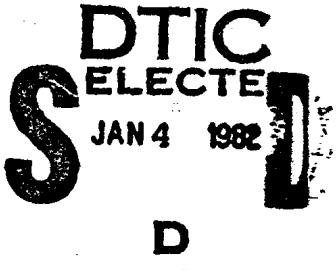

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Acute Mountain Sickness	Blood Coagulation	Climate Exposure
Air Ions	Body Temperature	Cognitive Function
Altitude Acclimatization	Catecholamine	Cold Induced Vasodilation
Anaerobic Power	Chemoreceptors	Cold Injury
Biometerology	Chronic Hypoxemia	Dehydration

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A report of progress on the research program of the US Army Research Institute of Environmental Medicine for Fiscal Year 1980 is presented, as follows:

Program No.	Project No.	Task No.	Title
6.11.01.A	3A161101A91C	00	In-House Laboratory Independent Research
6.11.02.A	3E161102BS08	00	Defense Research Sciences, Army
6.27.77.A	3E162777A845	00	Environmental Stress, Physical Fitness and Medical Factors in Military Performance

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Electroencephalography
Endotoxin
Endurance Capacity
Energy Expenditure
Environmental Medicine
Environmental Tolerance
Evaporation Cooling Index
Exercise Capacity
Fatigue
Frostbite
Heat Stress
Heat Stroke
Hepatic Necrosis
Load Carriage
Human Performances
Hypothermia
Hypoxia
Insulation
Job Tasks
Maximal O_2 Uptake
Metabolic Acidosis
Military Operations
Moisture Permeability Index
Motivation
Motor Activity
Muscle Fibers
Muscle Strength
Obesity
Peripheral Blood Flow
Physical Fitness
Physical Training
Psychomotor Function
Pulmonary Aterial Hypertension
Pulmonary Edema
Rating Scales
Respiratory Control
Survey Analysis
Sustained/Continuous Operations
Sustained Human Performances
Symptom Self-Reports
Team Performance
Terrain Coefficients
Thermal Exchange
Thermogensis
Thermography
Thermoregulation
Tolerance Predictions

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WORK UNIT NUMBER AND TITLE		
020	Development of Survey Methodolgy for Analysis of Environmental Medical Illness and Risk	1
022	Ventilatory Control Mechanisms at High Altitude	7
024	Regulation of Body Weight	17
025	Development of Assessment of Biometerologic Variables and Their Influence on Health and Performance	21
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	026	026	Development of Capability of Assess Psycho-physiological Indices During Performance	27
	(Terminated)	027	Temperature and Sweat Production during Eccentric Work	40a
	(Terminated)	027	In Vivo Effect of 2,3-Diphosphoglycerate on Factor VIII Procoagulant and Factor VIII von Willebrand Activities	40c

FY 81 Project and Work Unit Number	FY 80 Project and Work Unit Number			PAGE
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	005		005 Models of Heat Disabilities: Preventive Measures	59
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	010		010 Structural and Functional Alterations in Cells, Tissues and Organs Induced by Exposure to Environmental Extremes	101
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		(Terminated)	012 Assessment of the Impact of the Environmental Stressors on Systematic Hypotention	
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(020)

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY

1. AGENCY ACCESSION	2. DATE OF SUMMARY	REPORT CONTROL SYMBOL
DA OC 6129	80 10 01	DD-DR&E(AR)636

3. DATE PREV SUM'RY	4. KIND OF SUMMARY	5. SUMMARY SCTY	6. WORK SECURITY	7. REGRADING	8a. DISP'N INSTR'N	8b. SPECIFIC DATA-CONTRACTOR ACCESS	9. LEVEL OF SUM
80 01 31	R.CORRECTION	U	U		NL	☐ Yes ☐ No	A. WORK UNIT

10. NO./CODES	PROGRAM ELEMENT	PROJECT NUMBER	TASK AREA NUMBER	WORK UNIT NUMBER
a. PRIMARY	61101A	3A161101A91C	00	020
b. CONTRIBUTING				
c. CONTRIBUTING				

11. TITLE (Precede with Security Classification Code): (U) Development of Survey Methodology for Analysis of Environmental Medical Illness and Risk (22)

12. SCIENTIFIC AND TECHNOLOGICAL AREAS: 007900 Occupational Medicine; 012500 Personnel Selection, Training; 005900 Environmental Biology; 013400 Psychological; 016200 Stress Physiology

13. START DATE	14. ESTIMATED COMPLETION DATE	15. FUNDING AGENCY	16. PERFORMANCE METHOD
78 10	CONT	DA	C. In-House

17. CONTRACT/GRANT
a. DATES/EFFECTIVE: EXPIRATION:
b. NUMBER:
c. TYPE: d. AMOUNT:
e. KIND OF AWARD: f. CUM. AMT.

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FISCAL YEAR	PRECEDING 80	0.5	11
	CURRENT 81	0.5	26

19. RESPONSIBLE DOD ORGANIZATION
NAME: USA RSCH INST OF ENV MED
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20. PERFORMING ORGANIZATION
NAME: USA RSCH INST OF ENV MED
ADDRESS: Natick, MA 01760
PRINCIPAL INVESTIGATOR (Furnish SSAN if U.S. Academic institution)
NAME: SAMPSON, James B., Ph.D.
TELEPHONE: 955-2854
SOCIAL SECURITY ACCOUNT NUMBER:
ASSOCIATE INVESTIGATORS
NAME: STOKES, James W., LTC, MC
NAME: DA

21. GENERAL USE
Foreign Intelligence Not Considered

22. KEYWORDS (Precede EACH with Security Classification Code): (U)Survey Analysis; (U)Symptoms Self-Reports; (U)Questionnaires/Interviews; (U)Climatic Exposure; (U)Health Risk Factors; (U)Rating Scales

23. TECHNICAL OBJECTIVE. 24. APPROACH. 25. PROGRESS (Furnish individual paragraphs identified by number. Precede text of each with Security Classification Code.)

23. (U) Current medical records do not adequately define the number and type of Army personnel who suffer environmentally-induced illness and injury. Data must be obtained on the population at risk, on treatment follow-up, on partially disabling symptoms which go unreported, on the nature of exposure, and on medical risk factors due to job assignment, individual background, physical condition, and related health behaviors.

24. (U) This work unit develops and pilot tests new methods for survey sampling and epidemiologic studies of Army personnel exposed to specific climatic extremes and physical demands in training exercises. Questionnaires, structured interviews, personnel and medical record survey forms and observation procedures for the collection of subjective and objective data regarding exposure, symptoms, incapacitation, illness and injury under specific Army environmental conditions are designed, sample tested, revised and validated for subsequent routine use in other work units.

25. (U) 79 10 - 80 09 A cold weather background questionnaire and standard admissions log forms for use in medical treatment facilities were prepared and sample tested prior to use in a REDCOM exercise. Case record and environmental exposure and symptoms questionnaires, plus formal written instructions and aides for administration was designed and packaged in durable form for use by unit medics in a field study. Further improvements were made based on field experience. One questionnaire (the ESQ) was modified for scoring by optical scanner and tested; software for scoring conventional questionnaires rapidly with an X-Y plotter was written and tested. A videotape was prepared to train laboratory personnel in how to conduct structured survey interviews in field studies. Two versions of a Cold Weather Survival Quiz were compiled for use in evaluating training, and similar questionnaires for hot weather are being developed.

*Available to contractors upon originator's approval

Program Element:	6.11.01.A IN-HOUSE LABORATORY INDEPENDENT RESEARCH
Project:	3A161101A91C In-House Laboratory Independent Research
Work Unit:	020 Development of Survey Methodology for Analysis of Environmental Medical Illness and Risk
Study Title:	S/A
Investigators:	James B. Sampson, Ph.D., James W. Stokes, LTC(P), MC

Background:

Research methods of environmental medicine involve experimental studies which are valuable and necessary for answering important questions of basic mechanisms and processes of climatic stress. However, the experimental techniques which call for careful control of many variables are difficult to implement when trying to assess problems during military operations. Field research requires different methodology because of the lack of sufficient controls. An alternative is to rely on existing records to extract information on medical problems occurring in conditions of extreme weather. However, this too has limitations. Current medical records do not adequately define the number and type of Army personnel who suffer environmentally-induced illness and injury. Data are usually lacking on the population at risk, on treatment follow-up, on partially disabling symptoms which go unreported, on the nature of exposure, and on medical risk factors due to job assignment, individual background, physical condition, and related health behaviors. A third alternative develops and tests new methods for survey sampling and epidemiologic studies of Army personnel exposed to specific climatic extremes and physical demands in training exercises. Questionnaires, structured interviews, personnel and medical record survey forms and observation procedures can be used to collect subjective and objective data regarding exposure, symptoms, incapacitation, illness and injury under specific conditions. These survey instruments must be designed, sample tested, revised and validated for subsequent routine use in other work units.

Progress:

It is the purpose of this project to provide the methods for a better estimation of the Army's personnel preparedness for a variety of extreme

conditions. Three questionnaires have been compiled which were designed to evaluate knowledge of cold weather survival. Copies were sent to the Army's Northern Warfare Training Center in Alaska for evaluative testing. Pilot tests will also be conducted on untrained civilians for comparison with Army personnel. The Environmental Background Survey Form, which assesses experience with climatic extremes, has been used in a number of studies including a recent study of Marines in Norway conducted by the Naval Submarine Medical Research Laboratory. Samples from two Army posts, one northern, one southern, indicates there may be regional biases in the distribution of experience of personnel. The distributions are such that individuals from southern climates are more likely to be assigned to southern posts and those from northern climates to northern posts. Given that a high proportion of the Army's personnel in the field are from a southern climate (estimated at 60%) these results suggest that a majority do not have and are not likely to get any significant experience with cold weather. Therefore, this would contraindicate the frequently recommended policy of personnel selection of cold climates since more personnel, not less, need to gain cold weather experience. However, more surveys are required for more definite exposure.

Improved versions of the Medical Record Log used in the Empire Glacier '80 study have been designed for such exercises as Brave Shield and Brim Frost. These forms are intended to help in reducing omissions and errors in field data collection. A modified medical case record log and an Environmental Exposure Checklist were designed and packaged in durable folders along with instructions and administration aids for use by unit medics (MOS 91B) in the field; this was pilot tested during a TCATA field experiment involving mechanized infantry in smoke environments at Fort Hood, TX. Procedures for collecting essential population statistics and applying particular sampling techniques have not yet been worked out fully but are an important aspect of this project. Such procedures require coordination with personnel statisticians who have the information necessary for conducting scientific sampling.

The Environmental Symptoms Questionnaire has recently been modified to include symptoms not previously covered, such as nose bleeding, loss of appetite, muscular stiffness, and a few others, for a total of 11 more items. The format of the questionnaire remains the same, and is still only two pages long. This new version has been administered during the recent Pikes Peak study conducted by the Altitude Research Division.

Publication:

Sampson, J. B. and J. L. Kobrick. The environmental symptoms questionnaire: revisions and new field data. Aviat. Space and Environ. Med., 51:872-877, 1980.

LITERATURE CITED

Dean, L. M. and K. Laxar. Morbidity forecasting and emergency medical care in cold weather operations. Paper presented at the American Psychological Association Meeting, Montreal, Canada, September 1980.