

SWPMD 319.2

8 November 1957

MEMORANDUM THRU: DEPUTY CHIEF OF STAFF, WEAPONS EFFECTS AND TESTS

FOR: CHIEF OF STAFF, AFSWP

SUBJECT: Report of Temporary Duty Travel

1. In accordance with Travel Order No. SWP-466, dated 22 October 1957, Lt Colonel Sven A. Bach, LCDR William H. Chapman, and LCDR Charles H. Fugitt visited Rochester, New York; Boston, Massachusetts; and New York, New York during the period 28 October to 1 November 1957.

2. Persons and Places Visited:

a. University of Rochester, Rochester, New York

Dr. Joe R. Howland, Principal Investigator  
 Mr. Thomas Davis, Flash Burn Group  
 Dr. Mary Lou Ingram  
 Dr. J. Newell Stannard

b. Army Quartermaster Research and Development Center, Natick, Mass.

Dr. George Thomas, Chief, Thermal Radiation Program  
 Mr. Leo Fox, Project Leader, Thermal Radiation Studies  
 Mr. Fred Babers, Project Officer on Prog. 8.1, PLUMBBOB

c. New York Medical College, New York, N.Y.

Dr. Charles L. Fox, Jr., Principal Investigator

d. Sloan-Kettering Institute for Cancer Research, New York, N.Y.

Dr. James M. Nickson, Principal Investigator

e. Navy Material Laboratory, New York, N.Y.

Dr. Mixer, Medical Consultant  
 Mr. Derksen

3. Subjects Discussed:

a. University of Rochester

Dr. Howland has in recent months become convinced that certain biochemical systems are perhaps "key" points in the development of the

*Persons  
and  
places  
visited*

SWPMD 319.2

SUBJECT: Report of Temporary Duty Travel

radiation syndrome and the question still remains as to the relation and relative importance of these "key" points between different species. He is also concerned with the role that endocrine systems may play in this picture, in particular, with respect to aging, either normal or as a result of radiation.

One interesting philosophical point which was brought out is Dr. Howland's growing conviction that the only people properly equipped to operate in our present society are those who would be clinically designated as hyperthyroid. This seems to imply, among other things, an important role in the immunological response of the individual, as Dr. Howland has alleviated certain allergy symptoms in euthyroid individuals by making them hyperthyroid. If subsequent work confirms this, the relationship of endocrines and changes in protein specificity could be demonstrated with many interesting implications in many aspects of physiological chemistry, including aging.

There seems still to be a great interest at the University of Rochester in the highly controversial properdin system which is being studied in the dog. The recent death of Dr. Pillemer at Western Reserve has put a stop to some of this work, since a cooperative program between his laboratory and the University of Rochester had been in effect for some time. Properdin is of interest because its titer drops consistently in irradiated animals and it plays an important role in the body defenses against gram negative bacteria which in turn appear to play some part in the terminal stages of radiation injury. There is a species correlation of normal properdin titers with sensitivity to radiation. Properdin also has something to do with resistance and susceptibility to tumor transplantation. Dr. Howland wondered if some way would be found to obtain materials and equipment from Dr. Pillemer's now inactive laboratory in order to continue the investigation.

Mr. Thomas Davis, Flash Burn Group, has completed most of the instrumentation required for his new program of investigating the time-temperature responses in living pigskin during the course of flash burning. This system requires the accurate placement of fine thermocouples at various known depths in the skin and obtaining accurate time-temperature traces during the course of exposure to thermal radiation. It seemed apparent during the discussion that there may be some changes made in the injury criteria currently used at Rochester to define and quantitate various degrees of injury. One new and interesting concept is the current interest at Rochester in certain changes which may be expected in collagen fibrils in the corium and sub-cutaneous tissue. It appears to the undersigned that thermal changes at such depths may indicate a greater degree of injury than is significant for military prediction purposes. However, if this aids in quantitating thermal injury, it may still be useful in the over-all picture.

Dr. Mary Lou Ingram (who has the most beautiful eyes of any known physician) spent all last summer in the field surveying groups of

Repo  
JK  
Radio  
8

SWPMD 319.2

SUBJECT: Report of Temporary Duty Travel

uranium miners. These people are constantly exposed to near maximum permissible concentrations of radioactive substances. Dr. Ingram's idea is to follow hematologically a large number of miners. The current project is to establish a base line for the follow-up studies. It was suggested that whole body counting might be useful at this stage to supplement the blood studies. It will take about a year to examine the vast number of slides that she has collected.

At the request of Mr. J. Graham, AEC, Washington, D.C., Dr. J. Newell Stannard was contacted regarding the existence of data pertaining to the inhalation of I-131 vapor. Dr. Stannard said that he is not aware of any work that is being done along these lines, but that he is equipped to do it. Dr. Stannard was pleased to learn that there is a growing interest in the vapor hazard from nuclear reactors, which he considers very important.

b. Army Quartermaster Research and Development Center

Certain personnel changes at Natick are of interest in connection with their thermal radiation program. Dr. J. Fred Oesterling has moved up on the Administrative Staff and has been replaced by Dr. George Thomas, who seems to be the Chief of the division responsible for the thermal radiation program. Mr. Leo Fox is now project leader on thermal radiation studies and Mr. Fred Babers, who was Project Officer on Program 8.1, PLUMBBOB, is still associated with clothing protection studies at Natick. During the course of the visit certain pig burning experiments were in progress. Strips of fabric were fastened together with an office-type stapler, the strips varying between 2 and 4 layers, including underwear, outer garment fabric, and 2 layers of proposed poncho materials. While there was no great tension forcing the fabrics together, there was also no significant spacing. The fabric assemblies were held firmly against the sides of anesthetized pigs and square wave pulses from a condensed carbon arc beam were applied to the outer fabric surface. The pig and fabric were held in contact with considerable pressure for 10 seconds after the exposure. Instrumentation was not available for either spacing or pulse shaping exposures, consequently it is difficult to understand what practical conclusions can be drawn from such an experiment.

The Natick solar furnace is nearing completion. It will consist of a parabola approximately 35 feet across with a focal length of about the same distance. A large heliostat to accommodate this aperture is also being constructed and an exposure house is situated between the heliostat and parabola. The optic axis is in a north-south direction and it seems probable at this latitude that considerable obscuration of the heliostat by the parabola structure will obtain. Front surfaced slumped mirrors will be used. The wisdom of this course is not obvious, particularly for the severe climate of Massachusetts. However, the Natick personnel expect a solar image of approximately 4 inches in diameter with a peak irradiance of approximately 60 cal/cm<sup>2</sup>/sec. This is not an unreasonable figure for the early stages of operation before degradation of the front surface begins. In addition, the solar fluxes permitting such intensities cannot be expected as a routine thing in Massachusetts.

c. New York Medical College

Dr. Fox is continuing his work with severe burns in Rhesus monkeys. The monkey has been selected because his reactions more closely parallel to the human response than other laboratory animals. Two kinds of burns have been employed: (1) a hot water burn at about 70° C; and (2) a magnesium flame burn at considerably higher temperature. Dr. Fox is interested in the flame burn because he feels it is more typical of the burns seen in hospitalized human patients. One observation for which Dr. Fox had no immediate explanation was the fact that the water burns at low temperatures seem to cause an earlier mortality than an equivalent body area burn achieved at higher temperatures. On discussion into the possible causes for this unexpected phenomenon, it was brought out that the high temperature (flame) burns constrict more, so that the resulting eschar occupies a smaller area than that of the lower temperature scald. Two possible mechanisms could be involved: (1) the smaller eschar of the high temperature burn results in a decreased body surface and thereby could interfere with excretion through the skin, especially the exudate through the now smaller burned area; and (2) high temperature burns usually result in a greater degree of coagulation with a resulting impediment to the free interchange of diffusible substances between the burned area and the rest of the body. Another item of interest involves the importance of the skin as a vital organ. Several monkeys have had the skin removed from areas equivalent to the burned area accomplished in the preceding two cases. A time table could be approximated as follows: low temperature wet burns survive about three days; high temperature dry burns survive about six days; skinned (but unburned) animals survive from 8 to 12 days. Dr. Fox seems to be approaching the following conclusions as a result of his work now in progress: fluid therapy, whether electrolyte, colloid, or blood, merely delays for a few days the inevitable death, as over-all survival does not seem to be significantly affected. Another interesting observation is the fact that all animals exhibit a severe depression of body temperature in the terminal stages. This is in direct contrast to the noted temperature rise in the terminal stages of ionizing radiation injury.

Dr. Fox exhibited color motion pictures of the three cases described above. One of the more dramatic illustrations was the fact that the burn injury on the ventrum of the animal seemed to be much more severe than on the dorsum, even though both burns were produced by the same insult. It was suggested to him that this was largely due to differences in skin thickness and that, in the interest of uniform skin injury, the exposures could be modified accordingly.

Some animals had the skin removed immediately (within 10 minutes) after burning in the hope that these animals might approximate the condition achieved by skinning without burning. However, this did not prove to be the case and no significant changes were produced by skinning the burned animal. It was suggested that perhaps an immediate cooling of the skin following burning might be achieved with ethylchloride followed

by the maintenance of the burned area at low temperatures by ice packs or cold water jacket in an attempt to ascertain whether or not this would affect the survival time. If any degree of protection were to be achieved by this method, one would then suspect that toxins produced in the skin or immediately underlying tissues might be prevented from diffusing into the systemic circulation. Negative results would constitute very strong evidence that any hypothetical toxins would be formed elsewhere, or perhaps might not exist, or that the formation and diffusion of the primary toxin is too rapid to be entrapped by this freezing procedure.

A similarity between certain aspects of the systemic response of x-rays and thermal radiation exposures has been noted clinically. In this particular instance, the ventral surface of certain monkeys was more severely damaged than the dorsal surface exposed to the same thermal exposure. Since exteriorizing and shielding of a portion of the small bowel during total body radiation exposure favorably influences survival, the question was raised: "What effect would isolating a portion of the small bowel during exposure to thermal injury have on survival?" This procedure might possibly be accomplished by altering the circulation to a segment of the bowel and exteriorizing this segment during exposure.

d. Sloan-Kettering Institute for Cancer Research

Dr. Nickson is continuing his work on whole body radiation in selected human patients. Understandably, the number of cases available is quite small, since patients for whom no other course of therapy has proven effective are the only ones utilized in this study. Of these terminal cases, a further reduction in the number of available cases is imposed by the rigid laboratory procedures necessary for this study. To date, only seven cases have been studied, but a protocol for a double-blind experiment has been prepared in great detail. It would be premature to attempt even tentative conclusions at this time, but there seems to be some reason for suspecting that the administration of triiodothyronine has a beneficial effect on patients subjected to whole body radiation. If this can be substantiated by experimental evidence, an interesting lead into the mechanism of radiatic action might be provided, particularly when viewed in conjunction with Dr. Howland's opinion concerning the alteration of protein structure and immunological response in hyperthyroid patients.

e. Navy Material Laboratory

Discussion here was confined to the skin simulant work now in progress. Dr. Mixter, medical consultant for this group, believes that the present NML simulant has already achieved the first purpose desired in that he believes it is now possible to evaluate summer-wear fabric assemblies in terms of expected injury in the following categories; no injury, mild injury, second degree burn, and more severe than second degree burn. Mr. Derksen, while not denying this, is still working on refining the accuracy of these predictions. However, as a scanning device to evaluate

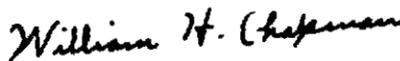
SWPMD 319.2

SUBJECT: Report of Temporary Duty Travel

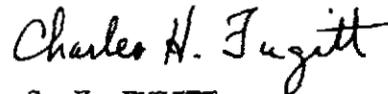
the thermal protection of uniform assemblies, this refinement is probably not required for the engineering purposes involved. Even though some personnel in AFSWP are willing to accept this conclusion, it is believed that any evaluations so obtained would not be accepted by some other laboratories concerned with developing thermal protection for the individual soldier.



SVEN A. BACH  
Lt Colonel, MC USA  
Chief, Medical Division



W. H. CHAPMAN  
LCDR, USN  
Analysis Division



C. H. FUGITT  
LCDR, USN  
Analysis Division



# AFSWP ROUTING AND CONTROL SHEET

**NOTE: This Routing and control sheet will remain attached to this communication until all action required is completed. After action has been completed it will be filed in the Adjutant General's Office.**

TO:	INITIALS	DATE	FOR	DATE RECEIVED	CONTROL NUMBER
3A CHIEF, AFSWP	P	11/21	APPROVAL		ET-85
AIDE			COMMENT		
3B DEPUTY CHIEF, USA	H	11/22	CONCURRENCE	319.2	
3C DEPUTY CHIEF, USAF	W	11/22	INFORMATION		
3 CHIEF OF STAFF			NECESSARY ACTION	SWPMD	8 Nov 1957
TECHNICAL DIRECTOR			NOTE AND FORWARD		
DCS/OPERATIONS			NOTE AND RETURN		
CHIEF, PLANS			COORDINATION		
CHIEF, OPERATIONS			FILE IN AGO		
CHIEF, TRAINING			SIGNATURE		
DCS/ADMINISTRATION			SUBJECT OR SUMMARY OF THE COMMUNICATION		
CHIEF, SECURITY			Report of Temporary Duty Travel		
CHIEF, PERSONNEL					
CHIEF, LOGISTICS					
CHIEF, BUDGET & FISCAL					
1 DCS/AWE & T	AL	11/18	TYPE OF COMMUNICATION: NUMBER OF COPIES, ENCLOSED AND ENDORSEMENTS		
DCS/R & D			Memo thru: DCS, Weapons Effects and Tests for: Chief of Staff, AFSWP		
INSPECTOR GENERAL					
HISTORIAN					
SURGEON					
2 ADJUTANT GENERAL					
TOP SECRET CONTROL OFFICE					
SECRET CONTROL OFFICE					
4 CENTRAL FILES		4 DEC 1957			
DOCUMENT REVIEW BRANCH					
ADMINISTRATIVE BRANCH					
PROPERTY AND SUPPLY BRANCH					
DOCUMENT LIBRARY					
SEC JBFS					

REMARKS

480