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8/23/84 Human Subjects Com. meeting

The committee suggests changes in the consent form as follows:

it must contain a paragraph addressing the risks of radiation exposure.

compare to population dose considered safe.

Tom Gibson & Mike Trent from H.C. will work on it

8/31/84

To: Paul Meyer

From: Mike Trent, Tom Gibson

Subject: Consent Form

We suggest that the statement be changed to read:

1) I understand that procedures for conducting this test will involve breathing for 120 minutes air labelled with the radioactive gases ^{13}N and ^{41}Ar.

2) I understand that possible risks and discomfort may result from the procedures. These include:-

a the discomfort of breathing through a mouthpiece for 120 minutes.

b A small risk associated with a 0.4 Rem exposure to radioactive gas. This exposure is ~~approximately~~ less than 1/10 that which a radiation worker can legally receive. The risk associated

with this exposure is equivalent to smoking three packs of cigarettes per year or driving 1500 miles.

(was attached to 1st NMRI VSI, 174-1
8/193

APPLICATION TO NMRI COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS

REF: SECNAVINST 3900.39A

I. PRINCIPAL INVESTIGATOR: Weathersby, P.K. LCDR, MSC, USN

II. ASSOCIATE INVESTIGATOR: Homer, L.D., Flynn, E.T., CDR, MC, USN
Meyer, P. (Livermore Laboratories)

III. TITLE OF RESEARCH PROJECT: Tracer Gas Kinetic Studies for Decompression Table Design.

IV. A. NO. The Livermore Committee will review the application before the experiments are begun.

B. N.A.

V. APPROXIMATE DATES OF RESEARCH: FROM: ~~8/80~~ 4/26/82 TO: 4/30/83 ~~9/81~~

VI. DESCRIPTION OF RESEARCH:

The project involves breathing a mixture of 20% oxygen and 80% Nitrogen 13 (up to 0.5 mci per liter) for a period of 120 minutes. The gas is equivalent to air except that the nitrogen is radioactive. For the ~~120~~ minutes of radioactive gas breathing, and for the 60 minutes following, the subjects will be ~~sitting in front of~~ resting on their back in a radiation detection device (a positron gamma camera). The radioactive nitrogen and argon was prepared on-site by bombardment of pure nitrogen with gamma rays and neutrons

Normal male volunteers from NMRI will be used. Six to ten subjects will be studied ~~twice each.~~ No medications will be used and no pain will be experienced. Only very minor discomfort will be felt from the requirement of breathing through a mouthpiece for ~~90~~ 120 minutes and remaining immobile ~~for 90 minutes.~~ during this period.

Previous work by us at NMRI has established the feasibility of analyzing the type of data sought (1) and completed a similar study on anesthetized dogs (2). Mr. Meyer, our colleague at Lawrence Livermore Laboratory has several years experience in equipment operation (3), and animal and human experimentation using radioactive nitrogen (4).

VII. a. What are the risks that may or may not be encountered by subjects?

The only risks inherent in the procedure are those arising from the special gas breathed. Chemical risks arise from the possibility of creating noxious gases in the radioactive nitrogen preparation. These could include ~~ozone and~~ nitrogen dioxide. The major risk is radiological, that is, the unavoidable exposure of subjects to ionizing radiation. The total dose of radiation from the total of the two studies is estimated to not exceed 0.5 rad to the lungs and 0.01 rad to the body (5). This dose can be compared to the 0.18 rad/year of natural background exposure of the total population; 0.026 rad for a single chest x-ray; * 5.0 rad/year, the current federal satutory limit for occupational exposure; and 4000 rads in clinical radiation therapy (6).

* max. permissible lung dose: 5rem/quarter, 15rem/year see K.S. letter of 12/5

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b. What are the safeguards against these risks:

The procedures to be used will attempt to minimize the chance of any chemical risks and to prevent any radiation exposure above the amount stated above. The radioactive nitrogen will be prepared using techniques developed by P. Meyer. Only very pure nitrogen will be exposed to the gamma-ray source (LINAC electron beam) ~~with water scatter).~~ After activation, samples of the gas will be taken and immediately analyzed for ozone, nitrogen dioxide and N-13 activity. ~~This analysis will be performed by the Livermore Hazards Control Department which is not otherwise involved with the research.~~ Only when these analyses are completed will the nitrogen-oxygen mixture be breathed by the subject. Expired gases will be directly vented outside the lab building to prevent any other exposure. Subject doses will be calculated by standard methods (5) since the major exposure is too localized and transient to be directly measured.

c. What benefit will science or the subject potentially realize?

No direct benefits will be realized by the subjects. Indirect benefits may be realized by U.S. Navy divers, a group that is expected to provide the majority of subjects. The project is designed to provide data on the rate of nitrogen uptake and elimination in the human body. Decompression sickness among divers is thought to be caused by an inability to remove the excess nitrogen from a diver's body after breathing high pressure air. Prevention of decompression sickness is approached by adherence to decompression tables that are calculated to match the rate of nitrogen removal with the rate of diver return to normal pressure. The study proposed will attempt to provide the data necessary for NMRI to provide the safer decompression tables required by 1982.

The procedures are well established at the Livermore laboratory and are well accepted nationally in the field of experimental physiology. The equipment and expertise are too specialized for any accepted clinical standard.

VIII. Informed consent is attached.

REFERENCES

1. Weathersby, P.K., E.E.P. Barnard, L.D. Homer, and K.G. Mendenhall. Stochastic description of inert gas exchange. J. Appl. Physiol: Respir. Exercise Environ. Physiol. 47:1263-69.

2. Weathersby, P.D., K.G. Mendenhall, E.E.P. Barnard, L.D. Homer, S. Survanshi, and F. Vieras. The distribution of xenon gas exchange rates in dogs. J. Appl. Physiol.: Respir. Environ. Exercise Physiol., in review, 1980.

3. P. Meyer, E. Behrin, R. Frank, R. Holub, and C.E. McJilton. Biomedical application of shortlived positron emitting isotopes. In: Schrack, R.A., Bowman, C.D., (Eds). Nuclear cross sections and technology. Washington, D.C.: National Bureau of Standards Special Publication 425 469-471, 1975.