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DEPARTMENT OF THE NAVY
NAVAL SUBMARINE MEDICAL RESEARCH LABORATORY
NAVAL SUBMARINE BASE NEW LONDON
GROTON, CONNECTICUT 06349-5900

IN REPLY REFER TO
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22 May 1989

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INSTITUTIONAL REVIEW BOARD

Dr. Barton L. Gledhill, Chairman
Institutional Review Board
L-452
Lawrence Livermore National Laboratory
Post Office Box 808
Livermore, CA 94550

Dear Dr. Gledhill:

I understand that you wished assurance that the Navy sponsored human gas radioisotope experiments cannot be performed in animals.

Human decompression sickness, the number one health problem for U.S. Navy divers, depends critically on the rates of uptake of inspired gas into the tissues of the diver. Traditionally the rates were estimated by simple theory. (It predicts simple exponential uptake in any organ of interest). Current Navy decompression tables based on this theory do not have acceptable safety and do not allow extrapolation into new operating conditions. Recent Navy work has highlighted the shortcomings in the theory, and shown that gas uptake is different (uptake of radioxenon in dogs is qualitatively different from the theoretical prediction of simply exponential). The 1980-82 Navy-LLNL experiments were intended to accept the qualitative kinetics based on animal work, and to estimate quantitative parameters for the gas of interest to us (nitrogen, not xenon) in the subject of interest (Navy divers, not dogs). The unexpected results from those experiments (uptake is not even monotonic, much less mono-exponential) convinced us that extrapolation between species was not reliable.

The 1989 experiments are intended to use an experimental design better able to recover kinetics in humans. In addition, the use of 2 gas isotopes simultaneously will establish scaling rules to allow prediction of how different gases behave in the human population of interest. The results will be immediately incorporated into a major mathematical modeling effort to improve our existing decompression schedules, and to extend into important operational modes where we simply have no existing experience.

In summary, many interesting experiments could be performed on animals, or for that matter with different gases or with different radioisotope protocols. However, we have learned that prediction of gas kinetics in humans is too unreliable with our present understanding and that direct experimental data is needed. The proposed human experiments will provide that direct information with immediate application, almost regardless of experimental outcome. That seems a reasonable use of limited resources, and seems so to the Navy divers at risk who are anxious to answer the questions.

Sincerely,

C. A. Harvey

Claude A. Harvey
Captain, Medical Corps, U.S. Navy
Commanding Officer

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Decompression Sickness Studies
With Radioactive Gases
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