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HOUSTON, TEXAS 77058

November 25, 1969

IN REPLY REFER TO: DC7/11/M39/69

MEMORANDUM TO: DA/Assistant for AAP

FROM : DC7/Food and Nutrition

SUBJECT : CA memo dated October 8, 1969 on medical experiments
MO71/MO73

As Principal Coordinating Scientist of the MO70 series of experiments, I would like to take the liberty to comment on the subject memo.

It is proposed that food consumed pre and postflight be identical to that used inflight. Such food does not require preparation and weighing in a special diet kitchen at KSC. The preflight period will be used to establish normal caloric intakes of the crews during their preflight activities. Close adherence to this level of intake during the inflight and postflight periods of the mission is desirable but, of course, not compulsory. This caloric control enhances the interpretability of the experiment but its omission is not catastrophic.

The AAP Food System will be designed to minimize the possibility of having to weigh uneaten portions of any food item during any phase of the mission. This will be accomplished in three ways:

1. The food will be highly palatable.
2. The food will be in small portions.
3. Foods will be selected, the mass of whose residue is amenable to accurate visual estimation.

No sweat sampling will be undertaken during any part of the preflight, inflight or postflight phases of MO71. Careful review of ground-based metabolic studies conducted both under contract to NASA and otherwise have revealed that the benefit to be acquired from sweat sampling does not justify the immense procedural difficulties it entails.

The volume measurements of liquid intake and the measurement of excreta is an essential part of the pre and postflight phases of the experiment as well as of the inflight phase. The chores associated with this task will be diminished pre and postflight as much as possible through the use of supporting personnel and equipment.

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The proposed inflight procedures do indeed involve excessive and unproductive use of crew time for manual manipulation of food, water and waste. This situation is unfortunate and its correction has so far eluded the most vigorous protests of the Medical Directorate.

MO/1 requires that caloric intake be maintained constant insofar as possible. Once the caloric intake of the crew is established during the preflight phase of the experiment while the crew is consuming flight food, it is hoped that this same intake will be maintained throughout flight. This procedure is recommended in order to rule out nutritional factors as a cause of any metabolic aberration which is observed inflight. No attempt will be made or, in fact, can be made to enforce this requirement, and its omission will not preclude some meaningful interpretation of the data obtained.

At the beginning of the mission, the crew will be given a nominal menu which will describe the range of choice he is permitted in each meal. These menus will not be voiced up on a daily basis. It is requested, however, that deviations from this nominal menu in the form of unconsumed, partially consumed, or unprogrammed food substitutions be reported. As has been pointed out above, great efforts will be made to eliminate the need for mass measurements of residual food. In the event any food is not amenable to having its residue visually estimated, then this food will probably not be included. If, on the other hand, it is so palatable that its inclusion is almost obligatory, then there will be no problem with waste estimation.

The crewmen need not log anything except the above deviations. If these are voiced down, then they need not be logged. The data required is date, crew member name, and container number - not time.

Water used to reconstitute food will be added according to the directions appearing on the food package. There is no need to log this procedure if it been adhered to in the nominal fashion.

The dry mass of feces does not have to be measured.

Inflight measurements of bone density have, of course, been considered, but cannot be implemented on the first three AAP missions. A program has been initiated at General Dynamics to develop inflight x-ray devices which consist of thulium source with a photographic record. The photon absorptiometry technique currently being employed at the University of Wisconsin and at the USPHS Hospital in San Francisco is also being assessed for possible application to the inflight situation. These concepts, however, are more properly a part of the Space Station rather than of the first three AAP missions. As CA emphasized, it will probably prove impractical to engage large portions of the Space Station's or Space Base's crew in precise balance studies. For these reasons, it is particularly important to develop alternative techniques for Space Station/Space Base experimentation.

The impact of shortening the control periods pre and postflight will be considered, and every attempt will be made to do this. Provision will be made to support food, drink and sampling collections at the times and places adjustable to the crew's preflight training schedule.

MO71/73 will be compatible with the varieties of the food available for AAP. Variety and palatability must be compromised to the extent necessary to insure accurate knowledge of nutrient intake. This requirement is basic to a metabolic study. Its omission would render the results uninterpretable.

Variation in the amount of food intake will be provided for. It is hoped, however, that this variation will be minimized. If food intake varies, then the food will be designed to allow it to vary with respect to calories alone, not protein. The experiment requires that protein intake be maintained at a fixed level. The chosen level of protein is well in excess of the Recommended Dietary Allowances and no decrement in palatability or nutritional quality will result because of this constraint.

The comments with regard to the logging of water intake are excellent and should be implemented.

Since ground-based studies will be performed to estimate residues in a normally emptied container, there is no requirement to weigh or otherwise estimate the mass of these containers.

Original Signed By

Paul C. Rambaut, Sc.D.

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DC7:PCRambaut:11-25-69

cc:

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DE/Mr. K. Hecht -