Battelle
Pacific Northwest Laboratories

Project Number 701840 -

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Date March 3, 1977

To H. M. Parker, Chairman
Human Subjects Committee

From H. E. Palmer HE Palmer

Subject Additional Information Regarding HSC 77-2, "Investigate Methods for Measuring Muscle and Bone Mass Changes in Astronauts"

Of the 14 points covered at the HSC meeting on February 14, 1977, I am to provide additional information on points 2 and 3.

In regard to point 2 as to whether an FDA-IND is needed, I have enclosed a copy of an AEC List of Well-Established Medical Uses. The use of ^{85}Sr as the chloride or nitrate is listed for bone imaging. Dr. Icayan of HEHF has stated that any procedure listed in this table does not need IND approval.

In regard to point 3, I have listed three references which, when combined, describe the use of ^{85}Sr in more than 700 patients using 50 to 100 μCi of ^{85}Sr in case. A textbook entitled Nuclear Medicine, by W. H. Blahd contains references to more than 36 published articles on the use of ^{85}Sr in bone scanning and this probably represents only a minor fraction of the total studies that have been done.

At the present time, the study is being held up by the legal staff which has requested NASA to provide more funding to buy additional risk insurance for this project. NASA has not yet replied to this request and it is not certain how this will turn out. When the legal staff has given approval to the project and the contract has been negotiated, I will submit to the Committee our final protocol which will include statements confirming the inclusion and consideration of all 14 points of your February 16 memo.

hep cl

attachment

HUMAN SUBJ.
MAR 4 1977
COMMITTEE

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FOLDER HSC 77-2

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REFERENCES ON THE USE OF ^{85}SR IN PATIENTS

L. Rosenthall, The Use of Strontium-85 for Detection of Bone Lesions, J. Canad. Ass. Radiol. 15:53 (1964)
(He performed bone scans on 300 patients during a 16-month period using 50 to 100 μCi of ^{85}Sr for each determination.)

J. C. DeFiore, et al, J. Bone Surg. 52 A:21 (1970)
(Used ^{85}Sr study of the spine in 100 patients.)

J. F. Dymling, Therapeutic Results in Renal Tubular Osteomalacia With Special Reference to Calcium Kinetics, p. 202 in Proceedings of 3rd European Symposium on Calcified Tissues, Springer-Verlay, Berlin, 1966
(Scanned more than 300 patients using ^{85}Sr)

The book, Nuclear Medicine, by W. H. Blahd contains references to more than 36 published articles on the use of ^{85}Sr in bone scanning, and this probably represents only a minor fraction of the total studies done with this isotope.

Table C

Radiation Dose From Commonly Performed Imaging Procedures

Procedure and Agents	Usual Administered Dose (mCi)	Radiation Dose (rads) Target Organ	Whole Body
I. BRAIN SCAN			
^{203}Hg chlormerodrin	0.7-0.9	70-90 (kidney)[1]	1.2
^{197}Hg chlormerodrin	0.7-1	8-10 (kidney)	0.083
^{99m}Tc-pertechnetate	5-10	1-2 (colon)	0.2
^{113m}In-DTPA	5-10	2.5-5 (bladder)	0.05-0.15
II. ^{131}I-HSA CISTERNOGRAPHY			
Normal	0.1	7.2 (sp. cord)	0.05-0.1
Hydrocephalic	0.1	12.3 (sp. cord)	0.05-0.1
Cervical Block	0.1	58.7 (sp. cord)	0.05-0.1
III. LUNG SCAN			
^{131}I-MAA	0.3	1-3 (lung)	0.12
^{99m}Tc-MAA	1-3	0.4-1 (lung)	0.01
^{99m}Tc-albumin microspheres	1-3	0.4-1 (lung)	0.01
^{113m}In-Fe (OH)$_3$ particles	1-3	0.75-2 (lung)	0.012-0.036
^{133}Xe	5-10	0.25-0.5 (lung)	0.001-0.002
IV. CARDIOVASCULAR BLOOD POOL			
^{131}I-HSA	0.2-0.3	2.9-5 (blood)	0.2-0.4
^{99m}Tc-HSA	1-3	0.04-0.12 (blood)	0.01-0.03
^{113m}In-transferrin	1-3	0.04-0.12 (blood)	0.01

V. PLACENTAL LOCALIZATION		Mother	Fetus	Mother	Fetus
^{131}I-HSA	0.005-0.010	0.073 (blood)	0.005	0.01	0.004
^{99m}Tc-albumin	1	0.043 (blood)	0.01	0.01	0.01
^{99m}Tc-pertechnetate	0.5-1	0.1 (colon)	——	0.01	0.03
^{113m}In-transferrin	1	0.12 (blood)	0.008	0.01	0.008

VI. THYROID SCAN		
^{131}I	0.05	65-90 (thyroid)	0.2
^{125}I	0.05-0.1	45-90 (thyroid)	0.06
^{123}I	0.05-0.1	1-2 (thyroid)	0.003
^{99m}Tc-pertechnetate	1	0.2 (thyroid)	0.01
VII. LIVER SCAN			
^{198}Au colloid	0.1-0.15	4-8 (liver)	0.1-0.25
^{99m}Tc-sulfur colloid	1-3	0.3-1 (liver)	0.008-0.02
^{113m}In-colloid	1-3	0.5-1 (liver)	0.015-0.03
^{131}I-Rose Bengal	0.15-0.3	0.2-1.4 (liver)	0.2-0.4
VIII. SPLEEN SCAN			
^{99m}Tc-sulfur colloid	1-3	0.3-1 (liver)	0.008-0.03
^{113m}In-colloid	1-3	0.5-1 (liver)	0.015-0.03
^{51}Cr-heated RBC's	0.1-0.3	4-10 (spleen)	0.05-0.07
IX. PANCREAS SCAN			
^{75}Se-selenomethionine	0.25	3.5 (pancreas) 7 (liver) 1.3-2.6 (gonads)	0.9-2.5
X. BONE SCAN			
^{85}Sr	0.1	3.1-4.6 (bone)	0.68-1.6
^{87m}Sr	1-3	0.1-0.5 (bone)	0.02-0.06
^{18}F	1-2	0.12-0.4 (bone)	0.03-0.07
^{99m}Tc-STPP	10mCi	0.45 (bone)	0.1
XI. KIDNEY SCAN			
^{197}Hg chlormerodrin	0.1-0.15	1.2-1.8 (kidney)	0.01-0.02
^{99m}Tc-iron ascorbate	1-2	0.5-1 (kidney)	0.008
^{99m}Tc-DTPA	1-2	0.05-0.1 (kidney)	0.03
^{99m}Tc-glucoheptonate	10-15 (incl. perfusion)	3-4.5 (kidney)	0.08-0.12
^{99m}Tc-dimercaptosuccinate	1-5	1.4-7 (kidney)	0.02-0.1
^{131}I-ortho-iodohippurate	0.2-0.4	0.2-0.4 (kidney)	0.006-0.012

[1]may be reduced 40-50% by a prior blocking dose of non-radioactive chlormerodrin.

Table D

AEC List of Well-Established Medical Uses
(As of July 1975)

ISOTOPE	CHEMICAL FORM	USE
Americium-241	Sealed source	For use in bone mineral analyzer (See Conditions, #1)
Cesium-137	Encased in needles and/or applicator cells	Interstitial or intracavity treatment of cancer
Cesium-137	Teletherapy source	Treatment of cancer
Chromium-51	Chromate	Spleen imaging
Chromium-51	Chromate	Placenta localization (See Conditions, #2)
Chromium-51	Chromate	Red blood cell labelling and survival studies
Chromium-51	Labelled human serum albumin	Gastrointestinal protein loss studies (See Conditions, #3)
Chromium-51	Labelled human serum albumin	Placenta localization (See Conditions, #2 and #3)
Chromium-51	Labelled red blood cells	Placenta localization
Cobalt-57, Cobalt-58 or Cobalt-60	Labelled cyanocobalamin	Intestinal absorption studies
Cobalt-60	Teletherapy source	Treatment of cancer
Cobalt-60	Encased in needles and/or applicator cells	Interstitial or intracavity treatment of cancer
Fluorine-18	Sodium fluoride (reactor produced)	Bone imaging
Gold-198	Colloidal	Liver imaging
Gold-198	Colloidal	Intracavitary treatment of malignant effusions
Gold-198	Colloidal	Interstitial treatment of cancer
Gold-198	Seeds	Interstitial treatment of cancer
Iodine-131	Iodide	Diagnosis of thyroid function
Iodine-131	Iodide	Thyroid imaging
Iodine-131	Iodide	Treatment of hyperthyroidism and/or cardiac dysfunction
Iodine-131	Iodide	Treatment of thyroid cancer
Iodine-131	Iodinated human serum albumin	Blood volume determinations (See Conditions, #3)
Iodine-131	Iodinated human serum albumin	Cisternography (See Conditions, #3 and #4)
Iodine-131	Iodinated human serum albumin	Brain tumor localization (See Conditions, #3)
Iodine-131	Iodinated human serum albumin	Placenta localization (See Conditions, #2 and #3)
Iodine-131	Iodinated human serum albumin	Cardiac imaging for determination of pericardial effusions (See Conditions, #3)

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Iodine-131	Rose bengal	Liver function studies
Iodine-131	Rose bengal	Liver imaging
Iodine-131	Iodopyracet, sodium iodohippurate, sodium diatrizoate, diatrizoate methylglucamine, sodium diprotrizoate, sodium acetrizoate, or sodium iothalamate	Kidney function studies and kidney imaging
Iodine-131	Labelled fats and/or fatty acids	Fat absorption studies
Iodine-131	Sodium iodipamide	Cardiac imaging for determination of pericardial effusions
Iodine-131	Macroaggregated iodinated human serum albumin	Lung imaging
Iodine-131	Colloidal microaggregated human serum albumin	Liver imaging (See Conditions, #3)
Iodine-125	Iodide	Diagnosis of thyroid function
Iodine-125	Iodinated human serum albumin	Blood volume determinations
Iodine-125	Rose bengal	Liver function studies
Iodine-125	Iodopyracet, sodium iodohippurate, sodium diatrizoate, diatrizoate methylglucamine, sodium diprotrizoate, sodium acetrizoate, or sodium iothalamate	Kidney function studies
Iodine-125	Labelled fats and/or fatty acids	Fat absorption studies
Iodine-125	Sealed source	For use in bone mineral analyzer
Iridium-192	Seeds encased in nylon ribbon	Interstitial treatment of cancer
Iron-59	Chloride, citrate and/or sulfate	Iron turnover studies
Krypton-85	Gas	Diagnosis of cardiac abnormalities
Mercury-197	Chlomerodrin	Kidney imaging
Mercury-197	Chlomerodrin	Brain imaging
Mercury-203	Chlomerodrin	Brain injury
Mercury-203	Chlomerodrin	Brain scans
Phosphorus-32	Soluble phosphate	Treatment of polycythemia vera
Phosphorus-32	Soluble phosphate	Treatment of leukemia and bone metastasis
Phosphorus-32	Colloidal chromic phosphate	Intracavity treatment of malignant effusions
Phosphorus-32	Colloidal chromic phosphate	Interstitial treatment of cancer
Potassium-42	Chloride	Potassium space studies
Selenium-75	Labelled methionine	Pancreas imaging (See Conditions, #4)
Strontium-85	Nitrate of chloride	Bone imaging on patients with known or suspected cancer
Strontium-87m	Sterile generator	To demonstrate areas of altered osteogenesis (See Conditions, #13)
Strontium-90	Medical applicator	Treatment of superficial conditions
Technetium-99m	DTPA (iron-ascorbate)	Kidney imaging (See Conditions, #5)

Technetium-99m	DTPA (tin)	Brain imaging (See Conditions, #6) Kidney function studies (See Conditions, #6) Kidney imaging (See Conditions, #6 and #7)
Technetium-99m	Human serum albumin microspheres	Lung imaging (See Conditions, #3 and #8)
Technetium-99m	Labelled disodium etidronate	Bone imaging (See Conditions, #9)
Technetium-99m	Macroaggregated human serum albumin	Lung imaging (See Conditions, #10)
Technetium-99m	Pertechnetate	Brain imaging
Technetium-99m	Pertechnetate	Thyroid imaging
Technetium-99m	Stannous polyphosphate	Bone imaging (See Conditions, #11)
Technetium-99m	Stannous pyrophosphate	Bone imaging (See Conditions, #14)
Technetium-99m	Sulfur colloid	Liver and spleen imaging (See Conditions, #12)
Technetium-99m	Pertechnetate	Placenta localization studies (See Conditions, #2 and #7)
Technetium-99m	Pertechnetate	Blood pool imaging
Technetium-99m	Pertechnetate	Salivary gland imaging
Xenon-133	Gas or gas in solution	Diagnosis of cardiac abnormalities Blood-flow studies Cerebral up to 1000 Muscle up to 200 Pulmonary function studies

Conditions:

1 Approved for Norland device only.

2 Requires confirmatory statement that
- a) test will only be performed in the third trimester,
- b) if the patient is bleeding, and
- c) if the obstetrician feels the test is necessary and will be beneficial to the management of the patient.

3 Standard blood product procurement condition required.

4 Special licensing criteria apply.

5 Approved for use with the Squibb "Renotec" kit.
License as technetium-99m labelled iron-ascorbate-diethylenetriamine pentoacetic acid (complex)

6 Approved for use with—
- a) Diagnostic Isotopes, Inc. Kit
- b) CIS Radiopharmaceuticals Kit
- c) Union Carbide by NEN Kit

7 Camera imaging system required.

8 Approved for use with—
- a) 3M Company Kit

9 Approved for use with—
- a) Procter & Gamble Kit

10 Approved for use with 99m-Tc MAA distributed by Cambridge Nuclear, Squibb, Mallinckrodt and Medi-Physics Kits

11 Approved for use with—
- a) NEN Stannous Polyphosphate Kit
- b) Diagnostic Isotopes Stannous Polyphosphate Kit

12 Approved for use with Tc-99 sulphur colloid distributed by—
- a) Mallinckrodt
- b) Cambridge Nuclear
- c) CIS
- d) Medi-Physics, Radimed Division
- e) Union Carbide (NEN)

and for use with kits distributed by—
- a) Squibb
- b) Abbott
- c) NEN
- d) Mallinckrodt
- e) CIS

13 Approved for use with Amersham/Searle Sterile Generator

14 Approved for use with Mallinckrodt, Inc. Kit