

WESTINGHOUSE ELECTRIC
 COMPANY

RICHLAND, WASHINGTON . . . TELEPHONE WHItehoUSe 2-1111

PNL-10298

HANFORD
 ATOMIC 719090
 PRODUCTS
 OPERATION

APPROVAL NO. AT-52

JAN 26 1962

REPOSITORY

PNL

COLLECTION

Dietary Studies

BOX No.

N/A

FOLDER

N/A

U. S. Atomic Energy Commission
 Hanford Operations Office
 Richland, Washington

Attention: Mr. J. E. Travis, Manager

Gentlemen:

EXPANDED USE OF WHOLE BODY COUNTER FACILITY

- Reference:
1. Letter June 29, 1961, WE Johnson to JE Travis, above subject.
 2. Letter Oct. 9, 1961, WE Johnson to JE Travis, above subject.
 3. Letter Nov. 9, 1961, WE Johnson to JE Travis, above subject.

The reference correspondence developed our reasons for proposing expansion of the use of the Whole Body Counter facility to include a suitable sample of non-occupationally exposed persons in the Hanford environs. Recent discussions between members of our respective staffs appear to have led to a basis for proceeding with such a program.

Specifically, in order to reduce the uncertainties in the estimation of radiation dose to residents in the environs from Hanford released radio-nuclides, we propose to examine annually about three hundred selected persons who reside in the immediate environs of the project and who are not employees of the Commission, the Company, or collateral contractors. It will be our plan to interest community residents in our Whole Body Counter through tours and open houses. In the course of their visiting our facilities they would be offered an opportunity to apply for an examination in the Whole Body Counter at a later time. Persons selected for this program will be from the Tri-Cities Area. No incremental expenses are anticipated in arranging for participants to be examined in the Whole Body Counter.

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GENERAL  ELECTRIC

U. S. Atomic Energy Commission

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APPROVAL NO. AT-52

We are aware of your desire to avoid undue publicity of this program and therefore plan to arrange tours or any other contacts between the public and the Whole Body Counter facility with this in mind. We do not intend to seek or originate any publicity in the local press on this program.

Attached are copies of an information brochure (A) which we would provide to those touring our Whole Body Counter; the application form (B) which will be part of the brochure when in final form; and the report form (C) advising the participants of the findings from their examination in the Whole Body Counter.

We propose to perform the foregoing work under the provisions of Article II, Section 9 (a) of Contract AT(45-1)-1350. If you approve such work and the allowability of costs incurred thereby, you may so indicate by signing the original and two copies of this letter in the space provided below and returning them to us.

Very truly yours,

W. E. Johnson
General Manager

COPY

WE Johnson:ARK:ljw

Attachments

APPROVED 2/19/62, 1962

U. S. ATOMIC ENERGY COMMISSION

G. M. Waggoner, Acting Manager
Hanford Operations Office

bcc: WE Johnson (2)
HM Parker
AR Keene
Record Center

ATTACHMENT C

STRICTLY PRIVATE

HANFORD WHOLE BODY COUNTER EXAMINATION

This is the report of your recent examination in the Hanford Whole Body Counter on (date) . The information is provided for your personal information. We hope you found the examination in the Whole Body Counter interesting and pleasant.

As explained in the brochure, while the Counter is an extremely sensitive device, it does not detect the presence of every radionuclide which could be in your body. The radionuclides listed are those which were detected. Column 1 lists the name of each radionuclide which was detected. Column 2 lists the quantity of the radionuclide detected expressed as a percent of that quantity recommended by the National Committee on Radiation Protection and Measurements (NCRP) as permissible for individuals in the population at large.

The NCRP is composed of over one hundred persons recognized as expert in some technical aspect of radiation protection. Included are scientists from universities, industry and governmental agencies. The NCRP functions under sponsorship of the National Bureau of Standards (NBS) which issues the recommendations of the NCRP as NBS handbooks. These handbooks are available to the public through the Superintendent of Documents, Washington 25, D.C. Copies of NCRP recommendations are also available for perusal at the Hanford Whole Body Counter.

RESULTS

Column 1

Column 2

The actual quantity of radioactive material in a human body is expected to vary, even from day to day. It depends on a number of factors, including dietary habits of the individual, where he has lived, his age, his weight, the extent of fallout from atmospheric nuclear weapons testing, as well as the characteristics of the radionuclide itself.

Radiation Protection Operation
General Electric Company
Richland, Washington

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Presentation for 4'th, 5'th and 6'th grade pupils in Benton City schools

Outlining

~~Outline~~ this brief lecture has the following objectives: (1) It is to attempt to give to these children the concept of radioactive atoms (2) also to give them the concept of radiation, (3) to explain to the children the sources and pathways of radioactive material whereby they become part of the human body, and (4) to explain to the children the nature of this experiment, how they can cooperate in it, and the instructions for their diet questionnaire and whole body counting experiment. The visual aid materials to be used in the lecture include the motion picture, "A is for Atom", an electric lantern, an electric iron, a GM counter equipped with an enunciator and a radium dial watch as a radiation source. I also plan to distribute copies of the General Electric cartoon book entitled, "Inside the Atom". Following a brief introduction, I will show the motion picture "A is for Atom" to fulfill the first objective, i.e., explaining the nature of radioactive atoms. Following the movie, I will stand by a table containing the other visual aids material and proceed with ~~the~~ an explanation approximately as follows: "Radiation detection and Radioactivity in Man". All of us are familiar with radiation. Whether we know it by that name or not, radiation is something that each of us encounters each day. Here for

example is an electric lantern. When I turn it on, we can see the light radiated from this little bulb. Visible light is a form of radiation all of us are familiar with. Here is another form of radiation. I am sure you have all seen an electric iron before. When I plug the electric iron into the wall socket, it gets hot. Perhaps some of you have found out how hot. As a matter of fact, you can tell the iron is hot even without touching it. When it has warmed up to a glowing heat, you can detect the heat by just holding your hand close to the iron. You do not ~~NECESSARILY~~ have to actually touch it. You are detecting radiation with your skin. The heat emitted by this iron is a form of radiation. Here we have seen two different forms of radiation, visible light and heat. Both of them are familiar to us and both of them can be readily detected by us. We have built-in radiation detectors for this type of radiation. Our eyes are detectors of X visible light radiation, little nerve endings in the skin are sensitive radiation detectors for heat radiation.

There are other forms of radiation for which we have no built in radiation detectors. This is the reason why atomic radiation sometimes seems to be such a mysterious thing. If it would glow or give off heat, we could

detect it without any other instrument, and it would no longer be so mysterious.

I am going to show you how you can detect this radiation with your ears.

Here is a special instrument which is built to detect radiation of the

kind that we cannot see or feel. This instrument has been hooked up to

an amplifier and speaker so that we can hear the instrument respond to

radiation. I will turn on this instrument. Now, where can we find some

radiation for the instrument to detect? I have some with me. I carry it

everywhere I go. Perhaps you have seen some like this before. It is a

wrist watch that has been painted with radium paint so that it glows in the

dark. The small amount of radium used in the paint gives off radiation

that this instrument will detect. As I bring the watch close to the ground

tube, you can hear the instrument respond.

This is an instrument that is not very sensitive to radiation. This

means that you have to have quite a bit of radiation before the instrument

will be able to detect it. My wrist watch has plenty of radiation for the

instrument to detect. However, I myself am also slightly radioactive. I

contain some radioactive atoms that are constantly giving off small amounts

of radiation too. However, the amount of radioactive material in this case

is very much less than that in my wrist watch. When I hold this counting tube against my arm or against my chest, we can not hear the response, because the instrument is not sensitive to detect such ~~XXXX~~ a small amount of radiation. For this I must have a very much more sensitive instrument. Such an instrument is used in a special counter that we have arranged for counting the radiation from people. We call it a Whole-Body counter. It is a very large instrument and has lots of fancy gadgets associated with it, but in general, it is just the same as this one only more sensitive.

How do people become radioactive? There are many sources of radioactive material that get into people and result in their being very slightly radioactive. Even before man discovered atomic energy people were radioactive. There are some natural radioactive atoms in the world that get into people and give small amounts of radiation. One of these is radioactive Potassium. We are able ~~XXXX~~ by using a very sensitive detector to measure the radioactive radium in people. Some radioactivity has been thrown into the atmosphere by atomic bomb tests. This material, which we often refer to as "Fallout", is extremely fine and has been gradually sifting down from the upper atmosphere for several years. The amount is extremely small. No one can see it, taste it, or feel it. However, it is possible to detect it with our very

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sensitive radiation detection instrument. Some of this radioactive fallout for example, the radio _____ of the element Cesium becomes incorporated in people. Therefore when we put people in our whole-body counter we can usually measure small amounts of radioactive Cesium. The local atomic installation at Hanford also contributes ~~XXXXX~~ small amounts of radioactive materials that can ~~XXX~~ in some cases be found in people living nearby.

The Columbia River water is used to cool the reactor at Hanford and when the water leads to the river, it contains small amounts of radioactive material.

This material gets into the drinking water of the communities downstream such as Richland, Pasco, and Kennewick. It also gets into fish. As people catch and eat fish from the Columbia River some X of this radioactive material will get into people. The amount of radioactive material is very very small. It is much too small to have any effect at all on the person or for him to tell that he has any radioactivity in him. However, we can detect it with our big sensitive radiation detector.

The research that I want you to help me with involves a study of how much radioactive material gets into people from the things they eat and drink. To do this you measure the amount of radioactive material in people and get them to tell me what they have been eating and drinking. Here you can see

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some of the things that people eat and drink from that they get radioactivity.

If vegetables or fruit are grown in an area where radioactive Cesium has fallen to the ground or where Columbia River water is used for irrigation, these foods can contain radioactivity which will be absorbed when people eat them. Likewise fish and other meat can also contain radioactivity.

Milk from cows that drink water containing radioactive Cesium ~~XXXXX~~ can also be a source of radioactivity. Drinking water that is obtained from the Columbia River or from other streams containing small amounts of radioactivity will also result in this material being found in people. As an illustration of how radioactivity gets into people from their food, consider the case of fish caught in the Columbia River. The cooling water from the reactors at Hanford is poured back into the Columbia River and contains very small amounts of radioactive material. This radioactive material is picked up by little plants growing in the river ~~XXXXX~~ which are in turn eaten by insects and water bugs living along the bottom of the river. These plants and insects form the natural food for fish. When fish eat them, the radioactive material becomes part of the fish. Then some lucky fisherman catches the fish and takes it home and cooks it. When the fisherman eats the fish,

XXXXX

- 7 -

some of the radioactivity ends up in the fisherman. For example, it may be found in one of ~~XX~~ his bones. Remember, we have available a special very sensitive instrument which can measure these very small concentrations of radioactive material.

In order for us to use this information, we must also find out from the fisherman or from whomever we measure in our whole body counter, what foods he has been eating. An important part of our study is to determine the kinds of food that each of us have been eating. To do this, we will use a questionnaire such as this one. I am going to ask someone to distribute these so that each one has one of these questionnaires. I hope that each of you will be able to read the questionnaire and understand it. If you do not perhaps your parents or your teacher may answer questions that you may have about it. If you wish to help with our research study, you must do your best to answer the questions on this card. You will notice on the back of the card are instructions that explain how to answer the questions. On the card is a place for your name and address. There is also a place for your ~~XXXXX~~ parents to sign to give permission to help us with this experiment. We must get your parents to sign this form before we can ask you to help.

Inside are the questions. You will notice the card has a hole punched in it which permits you to hang it on the wall. After you have answered the questions at the top of the page, you may hang the card on the wall of the kitchen and fill in the diet record. This is a list of the food you eat and the things you drink for seven days in a row. I would imagine that the easiest way is following each meal for you to mark the kinds of food and the amount you eat. If you eat or drink something away from home, you may wait until you get home to mark the form. The better record you keep of the food and water you drink, the better will be our results. I know that some of the questions are very difficult to answer. No one can tell exactly how much water he drinks, for example, at a drinking fountain each day. However, perhaps you can guess at the amount and just put your estimate in the space. If we get enough people to just guess at these questions, the mistakes they make will not be important, because they will tend to balance each other out. Next week on Wednesday, Thursday, and Friday we expect to be back in Benton City and will be ready to finish our experiment.

I will bring with me this very sensitive instrument that I mentioned to you before. It is so large that I have to bring it in a large moving van.

This big truck has been arranged like a laboratory, so that we can measure radioactivity in people very easily. Those of you who wish to help with the experiment will be given an ~~XXXX~~ opportunity to be measured in this instrument. Here is a picture of the instrument and how it works. The big instrument is mounted at this box. In order to measure all of the radioactivity in you, we ask you to lay down on the board. It's really a little platform on wheels something like a big skating board. There is a small electric motor that moves it very very slowly and it takes 10 minutes to travel so that all of you moves underneath this big radiation detector. This is a ~~XX~~ rather slow ~~XXXX~~ ride, isn't it? Only those of you who have taken the trouble to fill out this diet questionnaire and bring it back with you next week will be asked to be counted with this instrument. I hope that all of you will do it. Our experiment will be more successful if we can get lots of people to cooperate ~~XXXX~~ in it with us. ²After you have been counted, we will give each one of you a special certificate suitable for hanging on the wall of your room. It will certify that you have helped us ~~X~~ with this experiment and in addition, we will calculate from the results of the whole body counting how much Potassium you have in your body. We will ~~XX~~ write this in a special

place on the ~~ME~~ back of the certificate so that you will know that the certificate is particularly yours.

I certainly have enjoyed this opportunity to talk to you and tell you what I know about radiation and radioactivity in people. I hope that you will feel like asking me any ~~of~~ questions that ~~you~~ you may have that I can answer. Let us take a few minutes to answer questions if there are any.

BATTELLE-NORTHWEST

RICHLAND, WASHINGTON

PACIFIC NORTHWEST LABORATORY operated by BATTELLE MEMORIAL INSTITUTE
FOR THE U. S. ATOMIC ENERGY COMMISSION

INFLUENCE OF DIET ON RADIOACTIVITY IN PEOPLE

NAME (PLEASE PRINT)

ADDRESS

OF _____, RICHLAND, WASHINGTON
SCHOOL

Have you lived in this town all of your life? Yes, No.

If not, how many years? _____

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A B C D E
1 2 3 4 5

PLEASE READ THE INSTRUCTIONS ON THE BACK
BEFORE FILLING OUT THIS FORM

DATE OF BIRTH _____ month _____ day _____ year HEIGHT _____ inches, WEIGHT _____ pounds

GENERAL DIET INFORMATION

About how many times a week do you eat fresh fruit (other than canned or frozen)? _____ TIMES.

Do you ever eat fresh crabmeat, shrimp, oysters, or clams (other than canned or frozen)? Yes, No. _____ MEALS.

Do you occasionally eat fish caught in the Columbia River? Yes, No. _____ MEALS.

Do you occasionally eat game birds taken in this vicinity (quail, pheasant, ducks)? Yes, No. _____ MEALS.

What is the source of your families drinking water supply? Well _____ City water system _____

Where does your family obtain most of your fresh vegetables (carrots, lettuce, cabbage, etc.)? Grocery store _____ Nearby farms _____ Home grown _____

What is the source of your families fresh milk supply? Commercial brand _____ (usually _____ brand) From our own cows _____ From a nearby farm _____

Where does your family obtain most of your fresh beef? Meat market or grocery _____ Nearby farms _____ Home grown _____

Fresh pork? Meat market or grocery _____ Nearby farms _____ Home grown _____

Fresh poultry? Meat market or grocery _____ Nearby farms _____ Home grown _____

Have you lived in Richland all of your life? Yes, No.

If not, how many years? _____

I CONSENT TO HAVE THE ABOVE NAMED STUDENT PARTICIPATE IN THE STUDY ON THE INFLUENCE OF DIET ON RADIOACTIVITY IN PEOPLE AS DESCRIBED IN THE INSTRUCTIONS ON THE BACK OF THIS FORM.

Signed _____ Parent or Guardian

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Certificate of Appreciation

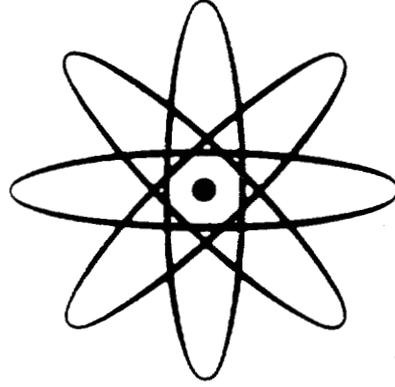


expresses appreciation to

For contributing to the study of influence of diet on radioactivity in people.

on _____

by _____



PACIFIC NORTHWEST LABORATORY operated by BATTELLE MEMORIAL INSTITUTE for the U. S. ATOMIC ENERGY COMMISSION

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Daily food record for the period from

date to date

	CUPS OF WATER (also coffee, tea, koolade, etc.)	CUPS OF MILK	CUPS OF OTHER LIQUIDS (juice, pop, etc.)	SERVINGS OF		SLICES OF BREAD OR ROLLS	SERVINGS OF CEREAL (corn flakes, oatmeal, etc.)	SERVINGS OF MEAT (OTHER THAN CANNED)								
				FRESH VEGETABLES	FRESH FRUIT			FRESH BEEF	FRESH PORK	FRESH CHICKEN	FRESH FISH	EGGS	OTHER (weiners, cold meat, etc.)			
DAY 1																
DAY 2																
DAY 3																
DAY 4																
DAY 5																
DAY 6																
DAY 7																
EXAMPLE	///	///	///	///	///	///	///	///	///	///	///	///	///	///	///	///
	///	///	///	///	///	///	///	///	///	///	///	///	///	///	///	///

(food that doesn't fit in these columns should be omitted—for example, omit ice cream, candy bars, cake, pie, cookies, etc.)

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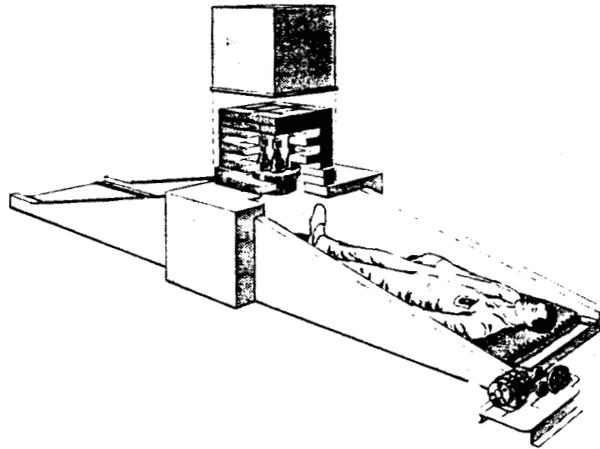
INFLUENCE OF DIET ON RADIOACTIVITY IN PEOPLE

Scientists from Battelle-Northwest would like you to help with a scientific study. The results of this study will help us understand the way people take up radioactive substances from their food. Very small amounts of radioactive material are found in nearly everything around us, including our food and water. Some of it occurs naturally, some of it comes from atomic energy projects such as atomic weapons tests and small amounts come from atomic plants such as Hanford. Even though the amounts are tiny, super-sensitive, modern electronic instruments can measure them. The purpose of the "Influence of Diet on Radioactivity In People" is to try and relate the radioactivity found in people to the food they eat. You can help us with this important scientific study by filling out this form describing your diet. You will be told when you are scheduled to visit the mobile counter at your school and you should bring this form with you. At the counter, which is in a large semi-trailer, you lie for ten minutes on a sort of cot that travels slowly under a counting instrument that works like a Geiger counter. Only those who bring their filled-in questionnaires with them may be counted.

DIET QUESTIONS: Please answer all of the questions on the other side of this card. Be sure to include your name and school on the front. Many of the questions can be answered by simply putting an X in the right box. In other cases there are questions such as "about how many meals per year?" Of course you don't know the exact number to put in that blank, so just try to make a good guess at it. On the lower part of the page is a place for you to keep track of what you eat and drink for seven days. You can start doing this on any day of the week, but the seven days should all be together and you should finish before your scheduled date to be counted. Please write down the dates on which you begin and end this seven day record. This card is made to hang on the wall at home so that you can mark down each meal. The food and drink you take at school or someplace else should also be written down when you get home. All liquids are reported in "cups" and we would like you to guess the number of cups you drink in between meals, for example, from a drinking fountain. By "other liquids" we mean fruit juices, soft drinks, etc. In each column you can enter marks which stand for either one cup of liquid or one serving of vegetables, cereal, etc. The last line is an example filled in to show you how to do it. If you have questions about how to fill in the blanks, perhaps your teacher or parents can help you.

After you have filled in and returned this questionnaire, and received a whole body count in the mobile laboratory, you can be sure that you have helped with a worthwhile scientific experiment. Thank you for your cooperation.

HANFORD'S



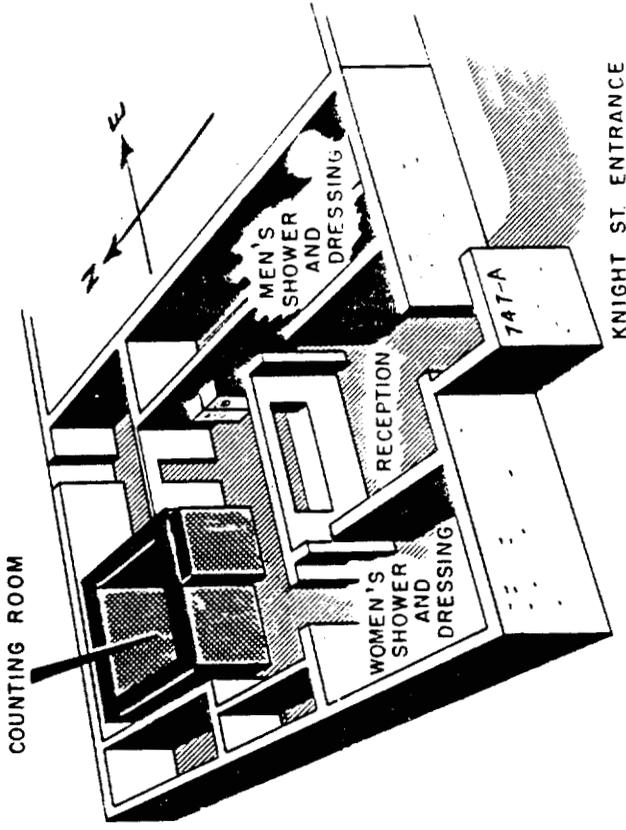
WHOLE BODY COUNTERS

RADIATION PROTECTION OPERATION

HANFORD LABORATORIES OPERATION

RICHLAND, WASHINGTON

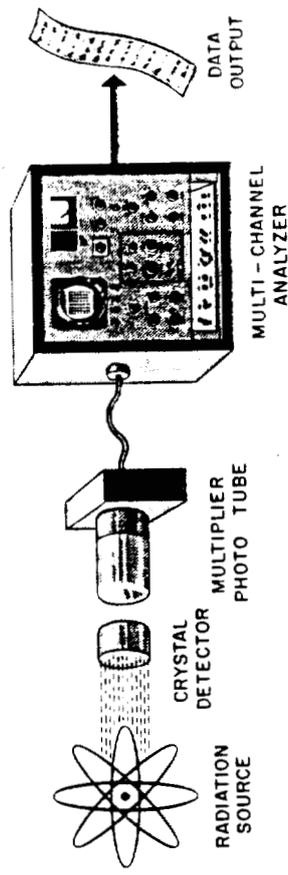
HANFORD'S WHOLE BODY COUNTERS



Hanford's Whole Body Counters are special facilities capable of detecting and measuring very small amounts of certain radioactive materials in the body. The Whole Body Counters are operated by the General Electric Company's Radiation Protection Operation. One of these counters is located at the 747-A Building on Knight Street in downtown Richland. This counter was completed in early 1959 and has been used for measuring the amounts of radioactive materials in thousands of Hanford employees. In mid 1963 another counter was completed. This counter was designed on an entirely different principle and is housed in a semi-trailer which may be moved from place to place.



In addition to radionuclides of natural origin there may be some from the low level wastes released from atomic installations or from fallout material such as cesium-137 from nuclear weapons testing. Persons employed in the atomic energy industry may encounter various radionuclides in the course of their work.



One form of ionizing radiation emitted by many radioactive material is the gamma-ray. The Hanford Whole Body Counters are very sensitive to gamma rays and can detect the presence of very small amounts of gamma ray emitting materials in the body.

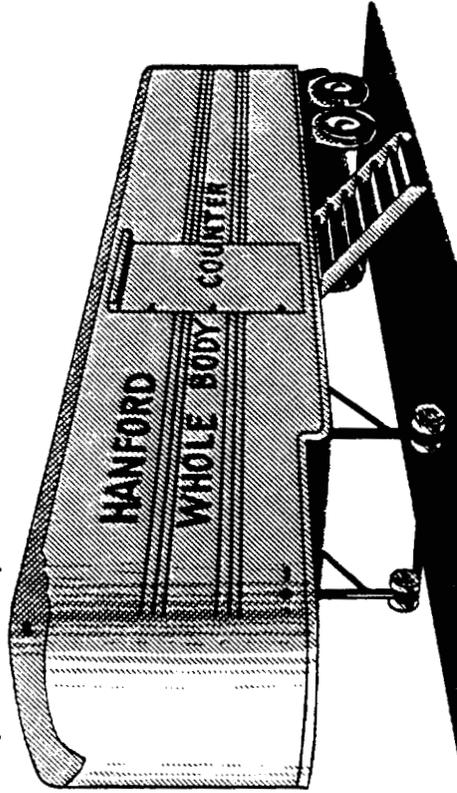
Whole Body Counters cannot detect all radionuclides. Alpha particle emitters and the very weak beta emitters are not energetic enough to penetrate through the body to the detector.

The heart of the Whole Body Counter in the 747 Building is an iron room in which the measurement takes place. The room is made of steel armor plate. The walls, floor, and ceiling are 10 inches thick, and the door alone weighs seven and a half tons. The purpose of this massive 120 ton structure is to reduce the effect of the natural radioactivity called "background" which is present in the environment. This source of radioactivity would otherwise be detected and would interfere with the measurements of the very small amounts of radioactive material in the person being examined.

Radioactive materials give off or emit ionizing radiation which cannot be detected by man's ordinary senses of touch, taste, sight, smell, and hearing. Special instruments are needed to detect these radiations.

Man has always lived in a world of radioactive material and is ionizing radiation. The universe around us, our homes, the food we eat and the air we breathe contains radioactive materials. The distribution and amounts of radioactive materials (radionuclides) in the earths surface vary from place to place. Because of these variations there are differences in the amounts and kinds of radionuclides found in people. Some radionuclides such as naturally occurring Potassium-40 are present in all people.

To prevent traces of radioactive material from being tracked in from outdoors, persons to be counted change into special clothing provided for wear while in the counter. During the time required for measurement, the person participating is seated in a comfortable contour chair. The time necessary for counting depends on the amounts expected and the precision required. Most often a ten minute count is sufficient. The counting room is air conditioned and music is played over an intercom system. The intercom system permits the person in the Counting room to talk with the Counter technician. The more recently completed whole body counter is in a semi-trailer. This counter differs from the one just described in that instead of a shielded room to exclude unwanted radiation the crystal is heavily shielded with lead bricks.



The person to be counted lays on a special motor driven bed which passes underneath the crystal. In effect as the person passes beneath the detector and its shield a background radiation shadow is cast over that part of the body directly below the detector. This shadow permits more of the radiation from the subject to be seen by the detector in relation to background radiation. For many radionuclides this "Shadow Shield" Whole Body Counter is just as sensitive as the counter in the iron room. For some radionuclides whose characteristic gamma ray energies are low the counter in the iron room is more efficient.

The Mobile Whole Body Counter was constructed to provide more convenient radiation measurement service for Hanford employees. In routine use this Whole Body Counter moves from area to area on a scheduled basis. Information obtained from Whole Body Counting becomes a permanent part of the employee's radiation exposure record.

Hanford visitors and others may be counted in the Hanford Whole Body Counters by appointment. Individual measurement results are provided to interested participants.

These measurement findings are stated as a percentage of the quantity recommended as being permissible by the National Committee on Radiation Protection and Measurements (NCRP). The NCRP is composed of over one hundred persons recognized as expert in some technical aspect of radiation protection. Included are scientists from universities, industry and government agencies. The NCRP functions under sponsorship of the National Bureau of Standards (NBS) who issues the recommendations of the NCRP as NBS handbooks. These handbooks are available to the public through the Superintendent of Documents, Washington 25, D.C. Copies of NCRP recommendations are also available for perusal at the Hanford Whole Body Counters.



Certificate of Appreciation



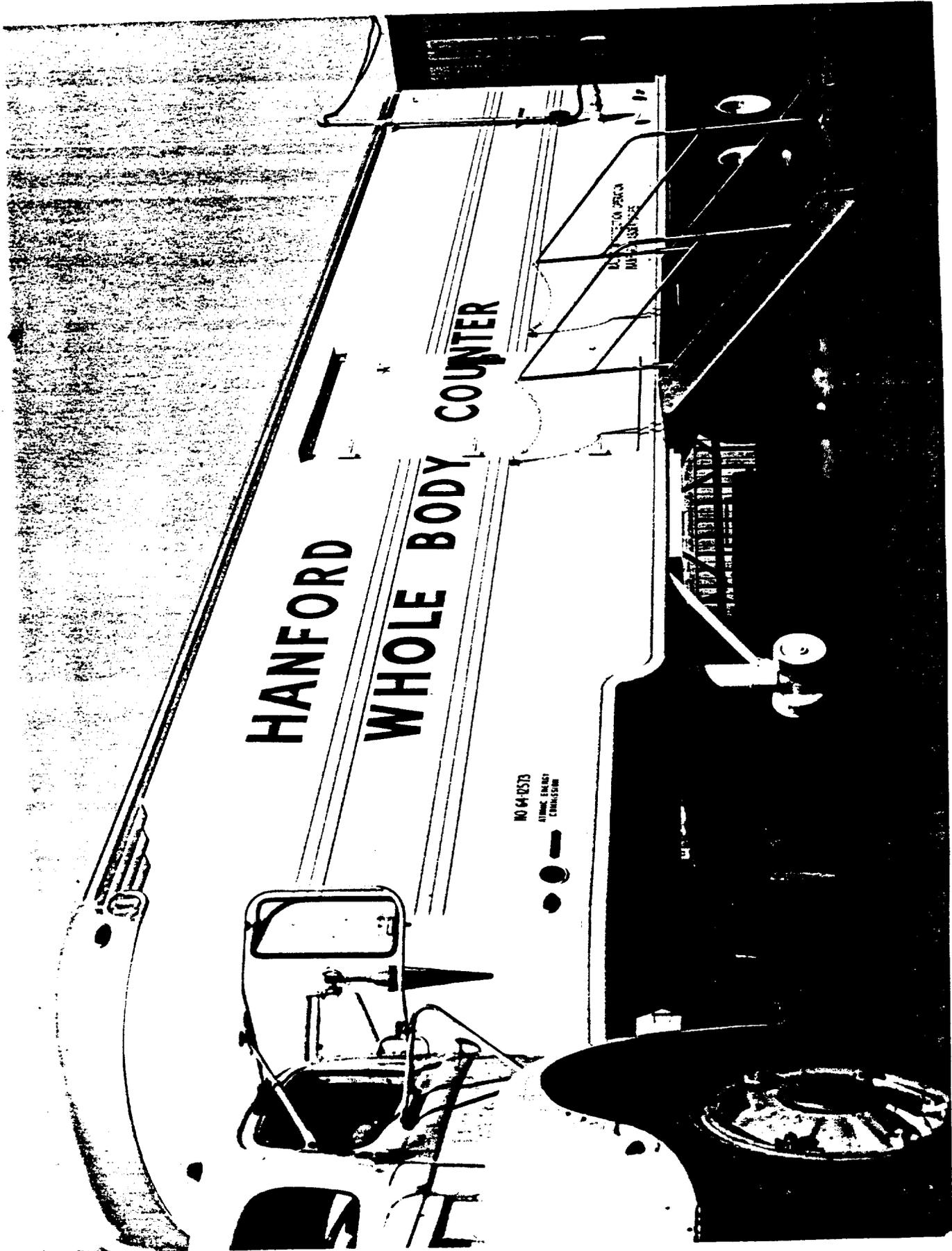
expresses appreciation to

For contributing to the study of influence of diet on radioactivity in people.



PACIFIC NORTHWEST LABORATORY operated by BATTELLE MEMORIAL INSTITUTE for the U. S. ATOMIC ENERGY COMMISSION

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HANFORD
WHOLE BODY COUNTER

NO 640253
ENGINE, TRANSMISSION

DO NOT TOUCH
HANFORD

1140251

SHADOW SHIELD WHOLE BODY COUNTER

