**Tech.-1** ***"Fat Absorption Studies Using Triolein I-131 and Oleic Acid I-125 Simultaneously."*** **ELIZBETH C. BLACKBURN, (Chief Technician, Radioisotope Section, Department of Radiology, Medical College of Virginia, Richmond, Virginia.)**

The purpose of this study was to show the feasibility (from both a technical and clinical standpoint) of performing a single fat absorption determination to differentiate between digestive and absorptive defects by using Triolein I-131 and Oleic Acid I-125 simultaneously.

These studies have been performed in six normal individuals, in two patients following pancreatectomy, and in one patient with non-tropical sprue.

Fasting patients were given oral doses of both Triolein I-131 (in ranges from 50 to 100 microcuries) and Oleic Acid I-125 (in ranges from 50 to 100 microcuries). Blood samples were drawn at three, four, five and six hours from the time of administration of the labelled fat in the normal patients, and beginning at one hour in the two patients having pancreatectomies. With the use of a pulse height analyzer, the gamma emissions of the two radioisotopes could be readily separated and counted in a scintillation well detector.

The results were expressed as a per cent uptake of the total dose administered. The normal individuals showed good absorption of both the Triolein and the Oleic Acid, with a mean uptake of 8.7% and a range from 6.3% to 16.8%. Patients with digestive defects showed a poor uptake of Triolein (less than 1%), but a good uptake of Oleic Acid (within the normal range). The patient with an absorptive defect showed poor uptake of both the Triolein and Oleic Acid (less than 1%).

Further studies will be performed on individuals with other types of digestive and absorptive problems to verify the results obtained so far.

**Tech.-2** ***"A Modified Scholer $T_3$ Test: Three Years Experience"*** **ALVIN EPSTEIN AND NORMAN D. LEE, (Bio-Science Laboratories Van Nuys, California.)**

The Scholer method for assessing the concentration of unsaturated TBG in serum was modified to satisfy the following requirements.

1. Automatic and reproducible dispensing of the radioactive resin.
2. Use of 1 ml. of serum for duplicate analyses.
3. Measure specimen and counting sample volumes automatically.
4. Non-dependence on incubation time.
5. Automatic radioassay of specimen only.
6. Simplify calculations.
7. Use of artificial abnormal reference sera.

Almost 3 years of routine daily use have shown the modified procedure to be precise and reproducible. One person can run and calculate 200 specimens in duplicate in an 8-hour day. The 95% confidence limits for paired duplicates is ±3.6%. Over a 6-month period, daily analysis of 3 different frozen reference serum pools showed values to range no more than ±6% from the means. The method will be presented and discussed in detail.

**Tech.-3** ***"Krypton 85 Inhalation Tests Versus Oxygen Saturation Studies for Detection of Left-to-Right Circulatory Shunts."*** **CYNTHIA A. WARD, R.T. (Chief Radioisotope Technician, Toledo Hospital, Toledo, Ohio.)**

Two well known methods for detection of left-to-right circulatory shunts, the oxygen saturation study which is performed by measuring the oxygen content in the vena cavae, chambers of the right heart, and pulmonary artery and the radioactive krypton 85 inhalation test, are compared. During ninety cardiac catheterization procedures in 1966, both krypton 85 inhalation tests and oxygen saturation studies were performed. The results of these and the numerous advantages of the radioisotope method will be discussed.

**Tech.-4** ***"Laboratory Errors Inherent in Plasma Volume Determinations"*** **CHERYL MITCHELL, PHILIP C. JOHNSON, M.D., AND FRED B. VOGT, M.D., (Department of Medicine, Baylor University College of Medicine, Houston, Texas; and Methodist Hospital, Houston, Texas. Texas Institute for Rehabilitation and Research, Houston, Texas; Univ. of Texas Graduate School of Biomedical Sciences, Houston, Texas.)**

Plasma volume determinations using radioiodinated human serum albumin ($^{125}I$ and $^{131}I$) are well established as clinical tests. Yet studies of the laboratory errors associated with the technique are few. We have compared simultaneously obtained $^{125}I$ and $^{131}I$ plasma volumes and the reproducibility of these plasma volumes in 12 normal males between the ages of 20 and 25. Three injections (of 2.5, 5, and 10 $\mu c$) were made with each isotope over a three hour interval. Blood was drawn 15, 30, 45, and 60 minutes after each set of injections to establish a disappearance curve. Statistical analysis showed a 95% confidence level of ± 230 ml (± 8½%) for an individual plasma volume. Three percent of this variation is a result of the plastic syringe variability, 2% the result of counting statistics, and the remaining error is probably due to biological variability. No difference of statistical significance was found between the simultaneously obtained $^{125}I$ and $^{131}I$ plasma volumes or between the disappearance of the two isotopes. This rate was about 12%/hour which is slightly higher than usually reported values. Calculation of plasma volumes from whole blood counts and a hematocrit showed greater variability than plasma volumes determined from plasma samples. This variability was only partly accounted for by variability of the microhematocrit, most of the error being due to difficulty in pipetting whole blood accurately. We will discuss the laboratory errors and problems inherent in clinical estimation of plasma volumes from the techniques we used here and how it is possible to extend these values to the techniques used by others.

**Tech.-5** ***"Comparison of the Effect of Storage of Serum at −10° Centigrade on the Irosorb-59 Test and a Colorimetric Method"*** **PATTYE R. KNUPP, LOUIS S. BECKER, M.D., BEN I. FRIEDMAN, M.D., AND JOHN J. WILL, M.D., (Radioisotope and Hematology Laboratories, Departments of Medicine and Radiology, University of Cincinnati Medical Center, Cincinnati, Ohio 45229.)**

One of the newest methods for determining the unsaturated iron binding capacity of serum is a resin sponge method called the Irosorb-59 test. The purpose of the study to be reported was twofold: 1) to compare the values obtained using the Irosorb-59 test with values from the colorimetric method of Cartwright and Wintrobe; 2) to determine the effect of serum storage at −10° C.

The latent iron binding capacity of 27 randomly selected patients was determined by both methods. Duplicate determinations were made on the same day on the same unstored serum from 11 patients. Serum from 16 patients was stored at −10° C. for 7 days and latent iron binding capacity values were determined. Serum from 7 of these 16 patients was stored at −10° C. for 14 days, and the latent iron binding capacity values were obtained.

Analysis of variance showed that the observed means of the Irosorb data do not differ significantly at the 5% level of significance. Similar analysis of the colorimetric data yielded the same results. Statistical analysis of the data from unstored serum only showed that the mean values do not differ significantly, although the variance of the colorimetric data was much greater than that obtained with the Irosorb method. The regression line of the colorimetric values on the Irosorb values was determined to have a slope of .898 and a y intercept of −23.8.

The results of the study may be summarized as follows:

1) Storage does not influence the mean values of the groups.
2) The variance of the Irosorb-59 values is less than those obtained with colorimetric method.
3) The colorimetric values are consistently lower than the Irosorb-59 values.

**Tech.-6** ***"A Method in Kidney Scanning for Better Visualization of Both Kidneys when the Function in the Two is not Equal"***, MARJORIE S. DEGRAFF AND JANET B. EMERY (Radioisotope Department, Middlesex General Hospital, New Brunswick, N.J.)

In kidney scanning, using a conventional scanner with a three-inch crystal, one uses instrument settings which eliminate part of the information. If there is a large difference in count rate between the two kidneys, the kidney with the lower count rate may be essentially erased from the recording devices by the instrument settings.

This count rate difference is apparent to the technician at the time of hand scanning. The maximum count rate for each kidney should be point-recorded on the paper scan. The initial scan is then performed in the routine manner, setting to the highest count rate obtained.

Following the regular scan, and before the patient is allowed to move, the probe is repositioned over the area of maximum count rate in the kidney with the lower count rate. The instrument is then readjusted, and the cathode ray tube and dot factor set in the usual manner, this time to the lower count rate.

For convenience, if only one cassette is available, the patient may then be repositioned, so that the second scan will fit on the same film and paper; or one may choose to use a new film and paper. The second scan need only include the kidney with the lower count rate, with a few passes over the kidney with higher count rate for orientation purposes. (The kidney with the higher count rate will appear black with no contrast.)

This method not only gives a more accurate size comparison of the kidneys, but also gives a better depiction of the internal morphology of the kidney with the lower count rate.

**Tech.-7** ***"Improved Liver Scan Technique"*** BARBARA A. FRITSCH AND VERNON F. WARD, (Radioisotope Service, V.A. Research Hospital, Chicago, Illinois.)

Artifacts due to diaphragmatic movement have long made the interpretation of liver scans difficult. With the advent of scintillation cameras and their rapid imaging, it has been possible to eliminate these motion artifacts by having the patient hold his breath. This technique, however, is all but impossible with the rectilinear scanner.

Our laboratory has developed a device and technique which minimize these effects. By the use of a restraining belt over the upper abdomen, breathing movements are restricted. The belt is easily adjusted by a tightening screw and release mechanism to suit all patients with very little discomfort.

Comparing scans made in the same patients using both the belt and normal breathing techniques, marked differences can be seen, particularly, in the abnormal scans. Not only are lateral edge lesions, which formerly were often missed more clearly delineated, but also what appeared to be defects in the dome of the liver are now clearly resolved.

**Tech.-8** ***"Clinical-Technical Development of Pancreatic Scanning"*** JERRY E. KURTZ, R.T. (ARRT), (Good Samaritan Hospital, Nuclear Medicine Department, Zanesville, Ohio.)

Since the introduction of $^{75}$Se-Selenomethionine as a pancreatic scanning agent, we have been developing and improving on the pancreatic scanning procedure. In the last four years three-hundred and two patients have had pancreatic scans performed in our facilities. Multiple crystal sizes and and several collimators have been thoroughly evaluated. For this procedure numerous patient protocols were utilized until our final procedure as practiced today was decided upon.

Pancreatic physiology, the pharmacology of $^{75}$Se-Selenomethionine, the patient protocol, pancreatic scanning technique and the clinical application of the procedure will be presented.

**Tech.-9** ***"Myocardial Scanning with Rubidium-84."*** **JONATHAN BOKELMAN, (Lawrence Radiation Laboratory, University of California, Berkeley, California.)**

Intravenous $^{84}Rb$ is rapidly cleared from the blood and is concentrated in the potassium space of the body with high concentration in the myocardium and skeletal muscle. Its positron emission character makes it ideal for high resolution scintiphotos of the myocardium when used in conjunction with the Anger-type scintillation camera.

Studies in six dogs with surgically produced acute coronary ligation showed that one hour following intravenous injection of rubidium the activity (cpm/gm.) of the infarcted myocardium was at least one-third that of the uneffected area.

In three dogs (two controls and one infarcted) clear visualizations of the myocardium were obtained with 10 to 15 minute exposures one hour after administration of 100-200 $\mu c$ of $^{84}Rb$.

Animal studies indicate that this isotope may have clinical value. Except for a somewhat higher radiation dose the patient would receive, rubidium-$^{84}$ has the following advantages over cesium-131: high resolution, short exposure time, and elimination of scatter and shadows caused by over lying tissue.

**Tech.-10** ***"Dual Isotope Technique for Cardiac Scanning"*** **NADEJDA D. POPCHEFF, R.T., (Isotope Laboratory Indiana University Medical Center, Indianapolis, Indiana, 46207.)**

The use of a combination of RISA and Rose Bengal I-131 in scanning the cardiac blood pool is described. This combination permits clear definition of the margin of the cardiac blood pool and the liver. Both of these radiopharmaceuticals are usually available in the small isotope laboratory so that they are available for emergency situations. We have found a low contrast scan, with no background cut-off to be accurate for diagnostic purpose.

**Tech.-11** ***"Current Techniques in Brain Scanning with Technetium-99m"*** **W. A. NORTH, T. P. SORANDES, J. K. LANGAN, R. A. HOLMES, M.D., (Division of Nuclear Medicine The Johns Hopkins Medical Institutions, Baltimore, Maryland.)**

Improvements continue to be made in the technical details of scanning procedures. We have found four innovations to improve the results of brain scanning with technetium-99m: (1) the use of a vertex view; (2) the administration of perchlorate to decrease accumulation of activity in the choroid plexus; (3) the administration of atropine to decrease the accumulation of activity in the mucous glands of the nasopharynx, oropharynx and salivary glands; and (4) the use of a new head position that optimizes visualization of the posterior fossa.

The accuracy of diagnosis increases when a lesion is found on at least two views. The vertex view at times provides the second positive and helps to characterize the size, shape and position of the lesion—information that is quite helpful to the neurosurgeon. With $^{99m}Tc$ pertechnetate it was necessary to modify the vertex view technique originally described by Overton. Instead of having the patient seated beneath the detector, we have the patient lie prone with the chin elevated so that the orbito-meatal line is parallel to the table and the face of the detector. Uptake of pertechnetate by the nasal and oral mucosa interferes with the detection of lesions in the front half of the head unless atropine is administered together with the pertechnetate. This drug prevents the uptake of pertechnetate in the mucous glands of the oropharynx and nasopharynx, as well as the parotid salivary glands.

In addition to the routine administration of atropine, we also give 200 mg of perchlorate by mouth to prevent the uptake of pertechnetate in the choroid plexus, which interferred with the interpretation of scans in about 15% of the cases when perchlorate was not given.

Lesions of the posterior fossa have been the most difficult to diagnose. Better images have been obtained by having the patient flex the head forward to elevate the lateral sinuses and permit a better view of the posterior fossa.

## Tech.-12 *"Delayed Tumor Uptake Using Chlormerodrin $^{203}Hg$"* ROBERT E. ZIPF, M.D. AND LENORA RALSTON, M.T. (ASCP), R.T. (ARRT), (Radioisotope Section, Miami Valley Hospital, Dayton, Ohio 45409.)

We have experienced delayed uptake in some brain tumors with scintiphoto (Nuclear-Chicago) techniques when the photo is taken two to three hours post-injection of chlormerodrin $Hg^{203}$. It has been found that a twenty-four hour scintiphoto will demonstrate the existence of a tumor which was not visualized in the two or three hour post-injection scintiphoto. Patients have had repeated scintiphotos twenty-four hours post-injection of the radioisotope. This study, when completed, will consist of approximately two hundred twenty-four hour repeat scintiphotos.

Procedure: The patient is given 2.0 ml. of mercuhydrin between 5:00 and 7:00 p.m. the night before the brain scintiphotos are to be taken. The next morning 700 $\mu$c for adult individuals or 10 $\mu$c/kg of chlormerodrin $Hg^{203}$ is injected. Four views are taken (A-P, P-A, right lateral, and left lateral) within two or three hours. Twenty-four hours later repeat scintiphotos are taken.

Many tumors not seen two to three hours post-injection are readily visualized in the twenty-four hour scintiphotos. There is less brain background and relatively more tumor uptake, and therefore, the procedure requires up to forty-five minutes for each exposure.

## Tech.-13 *"Scintiphotography with Technetuim-99m—Sulfur Colloids and the Gamma Ray Scintillation Camera"* DOROTHY L. TANNER, M.S., (Department of Nuclear Medicine Stanford University-Palo Alto Hospital, Palo Alto, California.)

The purpose of this paper is to show the effectiveness of the combination of a Tc-99m-sulfur colloid and the gamma ray scintillation camera for studying the morphology of the liver, spleen, and bone marrow. A Tc-99m-sulfur colloid made according to Patton's* simpified method or according to Larson and Nelp's** method collects either in the liver and spleen or in the bone marrow depending upon the size of the colloid particles. The Tc-99m yields high counting rates for at least two hours after injection.

Presently our laboratory uses the camera for investigating compounds to be used for scintiphotography or scintillation scanning and is used co-currently with a diagnostic scan. Scintiphotographs can be taken immediately following injection. With the resulting high count rate, the particular combination of the 140 KeV gamma-ray emitter and the gamma-ray camera, with its nearly complete absorptive capacity, yields results ten times more quickly than the routine diagnostic scan. Oblique, lateral and posterior views can be obtained in time comparable to that of a single A-P scan, since the entire organ is viewed usually at a single projection. The mobility of the camera itself increases the simplicity of its use.

With a comparison of the data of the Tc-99m-sulfur colloid and the free Tc-99m obtained through laboratory techniques such as that of the Geiger-Müller chromatograph and of the data from the gamma-camera, there is a controlled standardization for the scintiphotograph interpretations and analyses.

Exacting anatomical orientation and being able to diagnose without relying upon excess clinical information are presently incurred problems. Other technical problems include the ability to inter-relate the focusing, the intensity and the counting rate for reliable results.

The conclusion reached by our studies is that the gamma-ray scintillation camera in combination with a Tc-99m-sulfur colloid is a suitable method for studying the morphology of the liver, spleen, and bone marrow. The merits of the camera include the increased efficiency

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*Dennis D. Patton, M.D., Eugene N. Garcia, Ph.D., and Milo M. Webber, M.D. "Simplified Preparation of Technetium-99m Sulfide colloid for liver scanning."

**Steven M. Larson and Wil B. Nelp. "Radiopharmacology of a Simplified Technetium 99m colloid Preparation for photoscanning," J. NUC. MED. 7:817-836, 1966.

of absorption of the gamma rays, the increased speed of obtaining the photographic results, and the simplicity of the scintiphotography itself. The lack of standardization in the method and the controls of the chemical compounds employed must be lessened before the scintiphotography can be routinely utilized.

This work was done under the direction of R.A. Seltzer, M.D.

## Tech.-14 *"Clinical Advantages of the Scintillation Camera"* DORIS E. BRUBAKER, R. T. AND RAY J. BEASLEY, M.D. (Radioisotope Service, The Union Memorial Hospital, Baltimore, Maryland.)

In our hands the Anger scintillation camera has proved to be as good and at time superior to the conventional rectilinear scanner. To evaluate the merits of the scintillation camera we have compared its performance to that of the rectilinear scanner by doing paired studies on over a hundred and fifty patients. Standard routine views and additional multiple views were produced by the camera in a fraction of the time required when using the rectilinear scanner. We have also used the camera to perform rapid sequence studies.

In all cases we have found the resolution of each system when optimum collimation is used to be equal. The large crystal surface of the camera and its ability to view the entire organ at once with greater sensitivity enabled us to accumulate statistically acceptable counting rates.

The camera has allowed us to study the functional distribution of injected technetium-99m pertechnetate in the cerebral circulatory system. Unilateral carotid insufficiency is easily diagnosed with the rapid sequential films of the bolus injection.

An unlimited series of multiple views without the artifact of motion were taken in many of our camera studies. We found multiple films for the rose bengal iodine-131 liver studies to be of particular importance in visualizing the functional distribution over a span of time.

The principle limitation we encountered while using the camera was its diminutive image display, particularly in cardiac blood pool scanning where chest radiography and scan ratios are critical in deciding on the presence of a pericardial effusion. However, by using auxiliary photography equipment, such as the Polaroid MP-3 Land Camera, this problem can be eliminated.

The value of the additional information provided by the camera in our patient studies has convinced us that it need not be considered an ancillary instrument but rather the primary instrument in any radioisotope laboratory.

## Tech.-15 *"Uniformity in Rectilinear Scanning"* JACK N. HALL, (Radioisotope Service, Veterans Administration Center, Milwaukee, Wisconsin.)

Because of marked variation in results of rectilinear scanning it has been stated that scanning is more art than science. The purpose of this presentation is to demonstrate that scanning can now be approached on a more objective basis for the purpose of obtaining results as nearly identical as possible.

With the increase in count rate due to the higher doses of short half-life radionuclides an optimum information density or counts per $cm^2$ can be maintained. The minimum acceptable information density to permit "statistically valid scans" is 300 counts per cm or 1000 counts per $cm^2$ when a 3 mm light collimator is used. A more desirable scan is obtained with 500 counts per cm or 1500 counts per $cm^2$ respectively. This value can be obtained with either a fixed count rate and fixed scanning speed or with a variable count and the speed adjusted accordingly. Once this value has been determined, most of the remaining scan parameters are fixed. The method of accomplishing this on different rectilinear scanners will be discussed. The improved reproducibility of this scanning procedure will be demonstrated.

This procedure offers many advantages over present methods and is especially useful in supplying easily understood, precise instructions to the less experienced operator.

## Tech.-16 *"How to Judge Scan Quality"* WILLIAM K. OTTE, JR., (The University of Texas-Medical Branch, Galveston, Texas.)

The quality of a radioisotope scan is judged by how accurately the scan portrays the condition of the subject in terms of normal or disordered morphology and function. Insofar as the scan provides accurate and useful information, it is of good quality. In those respects, where it deviates from this, its quality is diminished. The scanning process is a complex one and producing a high quality scan depends on optimal conditions. This requires careful attention to detail and individual consideration for each type of study and even for each patient.

Therefore, a good quality scan is dependent on the cooperation and proper preparation of the patient, the selection of the best radiopharmaceutical, the choice of instrumentation, and the ability of the individuals involved in making and interpreting the scan. The need for constant attention to all of these areas will be emphasized, with some examples and discussion of the difficulties that could occur. The technologist, therefore, has an important role in contributing to the good quality of a scan by insuring that all of these principles and practices are taken into consideration.

## Tech.-17 *"The Assay of Low-Energy Gamma Emitting Radionuclides with Well-Type Ionization Chambers"* GARY A. WOOD AND OTHEL L. PIRTLE, (The University of Texas M. D. Anderson Hospital and Tumor Institute, and Hastings Radiochemical Works, Houston, Texas.)

The increasing use of short-lived radionuclides obtained from laboratory generators ("cows") requires the development of adequate assay procedures. These procedures to be practical for the average laboratory should be as simple as possible. Current methods of assay utilize dilution techniques with comparison to longer lived standards with similar physical characteristics.

Ionization chambers of well-type design permit assay of relatively large quantities of radioactivity, eliminate dilution errors, and eliminate the need for multiple standards for comparison. We have investigated characteristics of several chambers in regard to their response to low energy radionuclides. Corrections which can be applied to chamber current readings to obtain an accurate assay of the radioactivity have been developed.

The effects of source position, volume of material assayed, and operating voltage for various designs of well ionization chambers have been evaluated. Comparison of the sensitivity of several chambers to the radionuclides commonly used in Nuclear Medicine has been made.

## Tech.-18 *"A Uniprobe Dynamic Function Study"* R. W. DIELMAN AND E. J. MASON, (Nuclear Medicine Unit, St. Mary Mercy Hospital, Gary, Indiana.)

A single probe radioisotope dynamic function study was developed to provide a simple and reliable method for performing renograms using existing equipment rather than the usual multiprobe approach.

The results, of fifty uniprobe renograms, were evaluated technically with respect to instrumentation, materials, method, and results. Clinically, these renograms were compared to intravenous pyelography, $^{197}Hg$ renal scans, and other studies.

The uniprobe renogram proved to be as accurate and reliable as the multiprobe approach, but required additional care and time in performing and interpreting.

## Tech.- 19 *"Multiprobe Dynamic Function"* THOMAS A. NEWLIN, M.S., (Nuclear Medicine Service, Clinical Science Department, St. James Hospital, Chicago Heights, Illinois.)

Multiprobe scintillation detection has the potential of being the backbone of the small radioisotope laboratory. By accurate probe placement, imaginative manipulation of the dual rate computer, and the utilization of a tape system, a wealth of information can be obtained from a patient with a single injection of a tracer, upon one visit to the isotope facility.

It is not within the context of this treatise to present new techniques or application of tracers, but rather to present different techniques, and to graphically display some of the data obtained from suggested electronic settings using our equipment, and to show that it is not necessary to expose the patient to large amounts of radiation, multiple venipunctures, and unnecessary discomfort to obtain small bits of, often, unrelated information.

When preparing a patient for a liver scan using I-131 tagged rose bengal as a tracer, the dose is of sufficient volume and activity as to allow the following specific data to be obtained from the single injection:

(1) Cardiac Out-Put
(2) Hepatic uptake of Rose Bengal (same as BSP Function)
(3) Gall Bladder function
(4) Liver Scan

During the routine renogram using $^{131}I$ tagged Hippuran, the following information may be made available:

(1) Cardiac Out-put and/or bladder uptake
(2) Bilateral renal function (renogram)
(3) Urinary retention
(4) Renal plasma flow

Placental localization, extremity studies, simultaneous heart, liver, spleen external counting and many other techniques can be employed with a multiprobe system.

The liver function studies are based on seventy case studies. The renogram studies are based on 200 cases. Graphs of both normal and abnormal curves are to be presented in the presentation.

## Tech.-20 *"Procedure for Handling an Assay of 133-Xenon"* STEPHEN E. BOSTROM R. T. AND MERLE K. LOKEN M.D., PH.D., (Nuclear Medicine Clinic University of Minnesota Hospitals, Minneapolis, Minnesota.)

Xenon-133 is obtained as a fission product of Uranium-235 and has a half-life of 5.27 days and emits an 81 kev gamma photon. These physical properties together with its rapid diffusion into body tissues makes it suitable for studies in pulmonary function, cerebral blood flow, and coronary blood flow as well as blood flow to the extremities.

Xenon-133 gas is obtained in one Curie amounts contained in glass ampules of about 5cc volume each. For most of our work we desire, the Xenon-133 to be in sterile saline solution and have therefore devised a technique whereby this transfer may be accomplished without the introduction of any air, since the solubility co-efficient for Xenon-133 is much greater in air than it is in water.

After unpackaging, the Xenon-133 ampule is assayed for radioactive content and sterilized. All other apparatus to be used during the Xenon-133 gas transfer process is likewise sterilized in order that the procedure may be carried out asceptically.

Details concerning the actual transfer process as well as the method of assay and a brief summary of the clinical uses of Xenon-133 will be presented.

## Tech.-21 *"The Digital Rate Meter in a Laboratory of Nuclear Medicine"* NANCY BLOSSER, AND JANE DICK, (Section of Nuclear Medicine, Harrisburg Hospital, Harrisburg, Penna. 17101.)

Many articles have been written regarding linear-log rate meters versus digital rate meters. However, very few have considered the place of the digital rate meter in the everyday operation of a busy clinical laboratory.

Linear-log rate meters are basically electronic averaging devices that record a value reflecting preceding events. Digital rate meters on the other hand collect information for a given time period and display it as events per unit time. While this information is being displayed another identical scaler is collecting events for a similar period to be displayed later. By combining the digital rate meter with a pulse height analyzer and suitable data presentation system, you have an excellent tool for performing many of the routine clinical function studies.

The studies which are routinely performed on the digital rate meter in our laboratory include: Indicator dilution studies. Function studies such as Rose Bengal liver function, thyroid uptakes, splenic sequestration and placentagrams. Others including slide counting, urine assays, and gamma spectrometry.

The digital rate meter offers several advantages to the technician. This rate meter permits the selection of time intervals and exponents that assure statistical accuracy. It also releases the over-worked scanner from all but scanning functions. This instrument combines the accuracy of the simple scaler system with the multi-purpose dynamic study unit. Thus the technician deals with less equipment. Although this does cause scheduling problems it most certainly increases quality.

## Tech.-22 *"A Computer Program for Liquid Scintillation Counting"* R. W. HORNER, B.A., AND K. E. KINNAMON, D.V.M., (Nuclear Medicine Service Veterans Administration Hospital, Stanford School of Medicine, Palo Alto, California.)

Rigorous determination of the statistical significance of liquid scintillation counting data can involve calculations which are lengthy and laborious. Ideally, the error associated with a selected confidence level should be calculated for each number involved in the determination of the final result-DPM of the isotope or isotopes being counted. A digital computer is well suited for handling repetitious data of this type in a rapid and simple manner. Therefore we developed a program to perform these calculations. A minimum of electronics was required to interface the counting system with the paper tape punch. The data was punched directly in computer compatable format and processed by a nearby computer.

The newer, more advanced counting systems contain internal electronics which perform some, but not all, of these manipulations. Therefore it seems appropriate to review the mathematics involved. Calculations considered include: standard deviation, efficiency, % error, confidence levels, channels ratio error figures, least squares curve fitting, and multiple isotope counting. The program flow chart and mathematical examples will be shown.