counter was used for this purpose with a certain degree of success. However, the application of this counter to clinical cases was limited because of the rapid deterioration of the counter due to radiation, high operation voltage and restricted sensitivity to higher energy betarays of the counter.

Recently developments on a semiconductor detector overcame these disadvantages and are opening new possibilities in this field. Preserving the important characteristics of this detector, such as smallness, durability and low operation voltage, we made our detector into a catheter-type one and investigated its utilization in the field of clinical medicine. The first report was published in The Japanese Journal of Nuclear Medicine (vol. 3 (2) 110, 1966). We have continued to improve the detector and its associated electronic circuits.

The probe used in our experiment is made of a oxide-passivated silicon p-n junction detector, the outer diameter of which is reduced to 3 mm. The detector is enveloped in a thin silicone rubber sack (about 200 μm thick) and the signal cable is put into a KIFA catheter. As the window of this detector consists of a dead layer (about 2 μm) and the silicone rubber layer mentioned above, it is thin enough to be sensitive to medium and high energy beta-ray emitting nucleides such as ^{131}I, ^{32}P, ^{203}Hg and ^{85}Kr.

A completely transistorized low noise charge-sensitive preamplifier is developed to eliminate microphonic noise and to reduce the circuit voltage to ensure further safety. The field effect transistor is used in the first stage of the amplifier circuit.

All the basic characteristics of our device were studied and investigated into, including noise level; effect of bias voltage and temperature on count rates; linearity of count rates to the concentration of radiation sources; sensitivity and isoresponse curve. The noise increases with the raise of temperature and increase in bias voltage, but it can easily be excluded by the discriminator provided the temperature is below 45°C and the bias voltage is between 20 to 40 volts. The sensitivity of our detector is more than 3 cpm for 1 mμCi/ml ^{32}P solution and more than 2 cpm for 1 mμCi/ml ^{131}I solution. During the last several months we have been using the detector in our laboratory twice a week and left it in the vessels of dogs for several hours each time. So far, it seems to have practically unlimited life. Thus, it was proved that this device has many advantages over the catheter-type micro G-M counter as an in-vivo detector of radioisotopes.

Experiments were made on dogs and circulation time from femoral vein to inferior vena cava, and also from femoral vein to trachea was measured by using ^{85}Kr, with the detector inserted into the points to be measured. Experiment with circulation models showed the possibility of continuous measurement of the blood flow using ^{85}Kr infusion. Cardiac shunt detection was also performed with animals, using dogs.

Measurement of coronary and hepatic flow; detection of malignancy and bleeding in the gastro-intestinal tract; measurement of localized tissue activity with a needle-type semiconductor detector are scheduled to be conducted in the near future.

A Study on Small Type of Body-Surface Attachable Scintillation Detector

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With the available radio-isotope (RI) dynamic function detector, which is a stationary type, it is possible to take reliable external countings and recordings only when both the subject and the detector are fixed, but it is not so when the subject is in an unstable posture or while moving.

For the past three years we have been studying the hemodynamics of the liver with the use of RI, and have reported some interesting findings relative to changes in the liver accumulation coefficient (KL) at the time when the subject changes his position from supine posture to sitting position. Next, we have found that it is not possible to calculate the liver accumulation coefficient with the available detector when the subject is standing or moving and that a new type of detector is required for this. Therefore, we have devised a scintillation detector whose mutual position relation to the subject is stable so that it can transmit reliable informations to the scaler or to the recorder even when the subject changes his posture and position.

In constructing a detector that is stable and portable as well as attachable to the body surface, it is necessary to give a consideration to its size, shape, weight and the corset attachment to make it attachable to the body. Needless to say that it is desirable to construct a detector as small and light as possible. For this reason, we have attempted to construct a detector with a higher efficiency for counting γ-energy and a better shielding effect of lead shield, when using ^{198}Au and ^{131}I. We find that the most suitable detector is the one with a collimator of $60\phi \times 100$ mm, and the body surface attachment apparatus of flat surface with a side window of rectangular shape, 22.5×45 mm in its center, and attached with a shielding accessory to adjust the window area to its half when necessary. In addition, it is constructed as to be able to close the side window so that it can be used as an end window type. The scintillator is NaI (Tl), $1/2 \times 2''$ in size, with 152 AVP (Philips) as photomultiplier, and the detector measures $62\phi \times 268.5$ mm and weighs about 3 kg. We have also modified the corset to be attached to the body; namely, it is made to be attachable to the upper half of the body with a bag holding the detector in a fixed position, and the bag is stabilized by a band hanging from the shoulder so as to prevent it from slipping down. As the result the mutual position relation of the detector and the liver is fairly stabilized. Therefore, this new type of detector proves to be a useful apparatus in clinic.

Some Performance of a Universal γ Countor and its Clinical Application

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The universal γ countor represents the practical solution for laboratories conducting investigations with γ emitting isotopes. It is a system skillfully designed to eliminate many of the troublesome and time-consuming problems usually encountered with large, small and variable-volume samples.

The system incorporates two vertically opposed scintillation detectors that deliver accurate results with sensitivity practically double that of single scintillator system. With these individually adjustable detectors, we can adjust the detecting geometally for each sample in order to maintain high uniform counting efficiency over a wide range of sample volumes. The detecter assembly is housed in a large-volume counting chamber shielded by about 1000 kilogram of steal-encased lead. The detector outputs can be either summed or monitored individually by a mixed preamplifier. Its outputs can be measured by the scaler that include degital plesition and pulse height analyzers designed primarily for γ-rays spectrometry. The counting chamber is equipped with two shielded doors. One can be used for a large-sample, other for human arm counting or other applications requiring straight-through insertion of the sample. These doors are easy to open and close, and have stepped construction to prevent radiation leakage.

The performance data of the instruments