Absorption of Various Compounds to PVA Sponge

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We found that semiformalized polyvinylalcohol sponge (PVF) absorbs some compounds e.g. triiodothyronine, thyroxine, rose bengal etc., and is able to be put to practical use for $T_3{}^{131}I$ test. But the principle of absorption and another application of PVF are not obvious yet, and so we have checked the rate of absorption on PVF for many compounds under different conditions e.g. in saline or in saline and serum by using 65% and 72% semiformalized PVA sponge of 0.9 cm diameter. The compounds we have used are thyroxine^{131}I, triiodothyronine^{131}I, rose bengal^{131}I, diiodotyrosine^{131}I, sodium o-hippurate^{131}I, human serum albumin^{131}I, human serum γ-globulin and so on. For another compounds, too, we are going to check the rates of absorption on PVF in near future.

For instance, the rate of absorption on PVF in pool serum are as follows;

(1)

a) thyroxine^{131}I in saline 1 ml+serum 1 ml +PVF (2 cm long)

b) thyroxine^{131}I in saline 2 ml+PVF (2 cm long)

PVF	Incubation time (min.)	absorption rate of $T_4{}^{-131}I$ on PVF (%)	
		a	b
65%	20	2	2
	60	2	2
72%	20	2	2
	60	2	2

(2) triiodothyronine ^{131}I

a) $T_3{}^{-131}I$ saline 1 ml+serum 1 ml+PVF (2 cm)

b) $T_3{}^{-131}I$ saline 2 ml+PVF (2 cm)

PVF	Incubation time (min.)	absorption rate of $T_3{}^{-131}I$ on PVF at 20°C (%)	
		a	b
65%	20	20	90
	60	20	90
72%	20	15	90
	60	15	90

An Improved Technique for the Radioactivity Measurement of Blood Samples

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An improved technique of low level beta-counting was applied to measurement of RI concentration in blood. The method provides a lower detection limit with a good accuracy in the radioactivity measurement, thereby allowing the much smaller amount of both RI injection and the blood sample.

The instruments employed are a coincidence type low background β-ray scintillation spectrometer for β-emitting samples. The β-ray energy spectrum taken by the instrument prevents the measurement from the unwanted error caused by the radioactive impurities in the blood sample.

The principle of the β-ray scintillation spectrometer is as follows. The detector

consists of a scintillation counter having a hollow type plastic scintillator and a thin G. M. tube located in the hollow of the scintillator in such a way that the G. M. tube is covered by the scintillator with sufficient thickness. The sample to be measured is placed under the G. M. tube. It is essential that β-rays from the sample should be able to penetrate through the G. M. tube without appreciable energy loss and enter the scintillator. The detector is shielded by massive shielding material.

Using the coincidence technique, signals of the scintillation counter are recorded in a pulse height analyzer only when the G. M. counter responds simultaneously. β-particles emitted from the sample trigger both detectors and are recorded in the pulse height analyzer, but most of the background counts of the scintillation counter caused by γ-ray are not recorded.

Although μ-mesons in cosmic rays which cross the G. M. tube may be registered in the coincidence analysis, these counts can be easily distinguished from the sample counts, because their pulse heights are higher than a certain value determined by the minimum wall thickness of scintillator.

The background counting rate was about 0.09 cpm in the case of Na measurement, and detection efficiency was about 13%. The background has been quite stable and its variation has obeyed the statistical law. The measuring disc sample was prepared in following ways; the blood sample was separated by the use of a centrifuge and the serum of 0.2 cc was taken in a steel-made 2" planchet covered by tissue paper for dryness. The minimum detectable amount of ^{22}Na, defined as 3 times the standard deviation of the background, was about 0.1 $\mu\mu$Ci in a 10 hr. measurement.

The Direct Counting Method of Tritium-tagged Compounds in Blood with 2π Gas-flow Counter

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The liquid scintillation spectrometer is the most useful instrument for measuring Tritium-tagged compounds. But the quentching phenomenon by chemical or colorful substances disturbs measurement in the biological materials like serum or urine.

Two-π gas-flow counter is readily available for such purposes.

One ml. of 10 times diluted plasma (or serum) with 0.9% saline directly pippetted into planchet and dried sufficiently with gentle manipulations, then we find infinitely thick samples showing specific radial structures with relatively smooth surface.

These samples show sufficient reproducibility ($\pm$2.5%). But we must estimate the dried residue of 0.9% saline as about 0.64 mg/ml to consider the self-absorption because of their special structures.

The main sources of errors in this method are "charge effect" and insufficiency of gas-flushing.

When we repeat the measurements at least twice, "charge effect" can be recognized with abnormally decreasing counting rates, and flushing insufficiency is found from abnormally increasing counting rates. If such undesirable results are found, we must reject them and repeat again.

Efficiency of this method at just infinite thickness is about 2.5 percent.

Inspite of such low efficiency, relatively large maximal permissive doses for man arrow us precise measurements of Tritium-tagged compounds in blood with 2π gas-flow counter.

This method is well applicable for many other experiments.