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II. 7 A Study of Sum Peak Method in Biological Substances by Using ^{111}In

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In the measurement of the nuclides which emit γ -rays in cascade, sum peak formation is often observed in a γ -ray spectrum as a result of coincidence phenomena.

An influence of environmental or chemical states to the intensity ratio of the sum peak to the single peak has been studied by the present authors in the name of the "sum peak method". It was found that $^{152,154}\text{Eu}$, ^{160}Tb , ^{111}In and ^{113}mCd are the nuclides available with ease in this method.

In the previous work¹⁾ formation of ^{111}In -labeled bovine serum albumin resulted in different sum peak intensity ratio to that of $^{111}\text{In}^{3+}$ in an aqueous solution.

Denaturation of bovine serum albumin (BSA) is brought by addition of 8M urea to the solution of the albumin. In continuation of the sum peak method, the present authors tried to check the effect of denaturation of BSA in this paper.

The scheme of chemical procedures are given in fig. 1.

The results of the sum peak intensity ratio measurements are shown in table 1. As seen in the table the experimental errors are very small. If one compares the degree of change of the ratio from In^{3+} to In-BSA in this study with that in the previous one, a fairly good agreement is obtained.

A larger change of the ratio is seen between In^{3+} and denatured In-BSA . Viscosity increase of the denatured In-BSA solution has no effect in this system, as a test experiment of viscosity by using glycerol did not show positive effect at all.

Bonding between denatured BSA and ^{111}In might be stronger than that between normal BSA and ^{111}In from the measurement of sum peak method though one must be cautious to conclude or to generalize. Other methods for investigation of the biological macromolecule will be worthwhile to be applied in this case.

Reference

- 1) Yoshihara K., Miyoshi T., Suzuki Y., Kaji H., Research Rpts. of Laboratory of Nucl. Sci. 14 (1981) 55.

Table 1. Experimental Results on Sum Peak Intensity Ratios of ^{111}In in the Systems Involving BSA

	Isum/ $I_{\gamma 246}$ (%)	Isum/ $I_{\gamma 171}$ (%)
In^{3+} (aq)	1.908 ± 0.011	2.552 ± 0.011
	1.885 ± 0.012	2.519 ± 0.012
	1.853 ± 0.024	2.479 ± 0.024
	$1.882(\text{Av})$	$2.517(\text{Av})$
In-BSA	1.971 ± 0.019	2.637 ± 0.019
	2.012 ± 0.034	2.693 ± 0.034
	1.991 ± 0.108	2.662 ± 0.108
	$1.991(\text{Av})$	$2.681(\text{Av})$
In-BSA Denatured with 8M Urea	2.163 ± 0.005	2.892 ± 0.005
	2.121 ± 0.006	2.828 ± 0.006
	$2.142(\text{Av})$	$2.860(\text{Av})$
In^{3+} (aq) Viscosity adjusted with 25% Glycerol	1.921 ± 0.017	2.570 ± 0.017

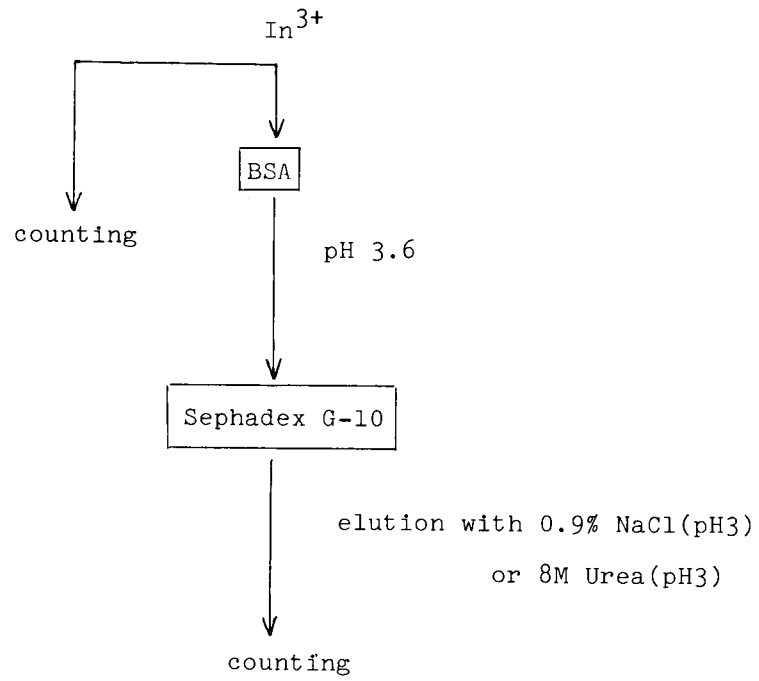


Fig. 1. Chemical Procedures for Sum Peak Intensity Ratio Measurements.