elaboration of the fluids which the membranes enclose as the fœtal kidney itself.

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[1] Widdowson, E. M., and McCance, R. A., Ciba Foundation Colloquium on Ageing, **4**, 209 (1958).
[2] McCance, R. A., and Dickerson, J. W. T., *J. Embryol. Exp. Morph.*, **5**, 43 (1957).
[3] Van Slyke, D. D., Phillips, R. A., Hamilton, P. B., Archibald, R. M., Futcher, P. H., and Hiller, A., *J. Biol. Chem.*, **150**, 481 (1943).
[4] Davies, B. M. A., and Yudkin, J., *Biochem. J.*, **52**, 407 (1952).
[5] Robinson, J. R., *J. Physiol.*, **124**, 1 (1954).

## An Iodine Compound associated with Albumin in the Plasma of Thyrotoxic Patients

A radio-iodinated protein, other than labelled thyroglobulin, has been found in the plasma of patients receiving radioiodine therapy for thyroid carcinoma[1]. Although this protein was associated with the albumin fraction of plasma protein, immunological techniques differentiated it from iodinated serum albumin[2]. The protein was detected after tracer doses of radioiodine (0·31–1 mc.) and was found only in malignant conditions[1].

Recently, however[3], an iodinated protein associated with the albumin fraction on electrophoresis was reported in the plasma of a cretin given a tracer dose of iodine-131. An earlier report[4], which seems to have been overlooked, described the presence of a fraction of activity, apparently protein, associated with serum albumin in the plasma of thyrotoxic patients receiving radioiodine therapy. It is the purpose of this communication to report confirmation of this latter finding, by another method of analysis.

In human plasma, thyroxine is carried by a specific protein forming a complex which on electrophoresis migrates to a position intermediate between $\alpha_1$- and $\alpha_2$-globulin[5]. In plasma examined after iodine-131 therapy, labelled thyroglobulin may also be found and must be distinguished from labelled thyroxine carried by its specific protein because they migrate to the same position between $\alpha_1$- and $\alpha_2$-globulin. If thyroxine is present in high concentration some will be carried by albumin, and this complex must be distinguished from iodinated protein of the same electrophoretic mobility. 20 μl. of plasma containing a little sodium thiosulphate were subjected to paper electrophoresis[6]. After drying at 100° C., the paper was passed through an automatic scanning device which recorded the positions of radioactivity on the paper. It was then stained with a solution of naphthalene black in methanol to locate the bands of protein, and washed in a solution of 10 per cent acetic acid in methanol. As this procedure completely removes thyroxine from its carrier protein, the activity remaining on the strip is assumed to be iodinated protein. Thyroxine labelled with radioiodine added to normal plasma can be completely removed from an electropherogram of the plasma in this manner, as can labelled thyroxine from electropherograms of the plasmas of those thyrotoxic patients in which no iodinated proteins are found. Plasma samples shown by electrophoresis to contain the albumin component also showed on chromatography a peak of radioactivity at the origin, presumably due to an iodinated protein.

Radioactivity associated with the albumin zone after staining has been found in the plasma of six of the thirteen thyrotoxic patients examined after the administration of therapeutic doses of iodine-131 (7–25 mc.). In three cases the albumin-like compound was the only radioactive component found after staining and washing the electropherogram. In three others radioactivity was associated with both albumin and thyroglobulin fractions, and in one of these the albumin component was detectable five days after treatment, by which time labelled thyroglobulin had disappeared.

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[1] Robbins, J., Rall, J. E., and Rawson, R. W., *J. Clin. Endocrinol.*, **15**, 1315 (1955).
[2] Tata, J., Rall, J. E., and Rawson, R. W., *J. Clin. Endocrinol.*, **16**, 1554 (1956).
[3] De Groot, L. J., Postel, S., Litvak, J., and Stanbury, J. B., *J. Clin. Endocrinol.*, **18**, 158 (1958).
[4] Larson, F. C., Deiss, W. P., and Albright, E. C., *J. Clin. Invest.*, **33**, 230 (1954).
[5] Deiss, W. P., Albright, E. C., and Larson, F. C., *J. Clin. Invest.*, **31**, 1000 (1952).
[6] Flynn, F. V., and de Mayo, P., *Lancet*, **261**, 235 (1951).

## Biological Activity of L-Tryptophan Esters

Rozendaal *et al.*[1] have shown that dry crystalline L-tryptophan, when irradiated with fast electrons at doses up to $10^9$ r., is partially transformed into a complex mixture of compounds from which it is possible to obtain by chromatographic separation a fraction which inhibits the growth of certain bacterial species.

We have attempted the fractionation of the same irradiated material (given to us by Dr. H. M. Rozendaal, General Electric Research Laboratories, Schenectady) and have isolated from it several compounds. About 20 per cent of the original L-tryptophan is transformed by the radiation into a complex mixture of compounds, some of which are in the form of free radicals—as can be demonstrated by the paramagnetic resonance spectrum obtained from the irradiated tryptophan.

Separation of the mixture into its components is still incomplete, and the results on this aspect of the problem will be the subject of a future publication.

In addition to the fraction described by Rozendaal we have obtained a different one, which has led to the finding that some tryptophan esters are active as growth inhibitors for several micro-organisms. This fraction (*WS* 55) was consistently obtained by elution from an alumina chromatographic column with *n*-butanol saturated with 1 *N* hydrochloric acid. Fraction *WS* 55 was purified and obtained in crystalline form from hot water after clarification with active charcoal ('Nuchar' *C*–190–*N*).

This compound has been identified as the *n*-butyl ester of L-tryptophan by comparison of its physical and chemical properties with synthetically prepared material[2] (Table 1).

Once the chemical structure had been established, it appeared that this compound could be formed simply as an artefact of the chromatographic technique and therefore does not necessarily have to be