In the first part of these studies on the fate of the $^{131}$I-label in metabolic studies with labelled proteins, the distribution volume of radioiodide was shown in the rabbit. Also details were given of the composition of this virtual space. Proportions of total blood iodide in the red cells were analysed separately in Part II. The present study will give information on the rate of excretion of $^{131}$I-iodide which can be anticipated under various experimental conditions.

General Aspects on the Problem of $^{131}$I-Iodide Excretion

The first attempts to estimate renal excretion of radioiodine quantitatively were made by Keating, McConahay, Myant, Power et al.*. These authors, together with Berkson, have introduced van Slyke’s clearance concept to define excreted amounts of radioiodine and worked out practical methods for its calculation. This procedure proved to be useful in measuring thyroid function, especially since in addition to renal clearance of $^{131}$I its thyroid clearance is separately measured. Concerning the mechanism of renal excretion itself, clearance studies of $^{131}$I-iodide have shown a partial (passive?) reabsorption of radioiodide, after having been filtrated at the glomerulus.

Information about the speed of elimination of $^{131}$I-iodide in protein metabolic experiments is required in order to calculate protein catabolic rates. A new method of calculation of catabolism by McFarlane is based on measuring the renal excretion rate of radioiodide along with the ratio of non-protein/protein-bound activity in the plasma, and the $^{131}$I-iodide space. Since some confusion is liable to arise in describing turnover studies if clearance terminology is adopted we wish to use here...
the term “half life of $^{131}$I-iodide excretion”, this being the simplest parameter to measure for this purpose. Moreover, it can be converted by the wellknown equation:

$$\frac{\ln 2}{\mu l/2} = K$$

into excreted rates/time ($K$), i.e. into units which are of practical use for further calculations. 

**Experimental**

Animals and radioactive material used in these experiments were reported in the first part of this series. The radioactivity was always injected intravenously. Sampling and counting of blood and plasma samples are described elsewhere. The initial plasma activity was obtained by dividing the injected dose by the plasma volume, the latter value being separately estimated using the Evans Blue dye method modified for rabbits. Subsequent values were expressed as percentages of the initial one and were plotted against time on a semilogarithmic scale. The disappearance of $^{131}$I-iodide from the plasma was followed till 0.1 to 1% of the initial plasma value was reached. The total body gamma radiation of the animals was measured in a ring counter. The first measurement was carried out 5 to 10 minutes after starting the experiment and these counts were used as the initial 100% value for total body $^{131}$I-iodide activities. Total body counting was continued down to a residuum of 1 to 2 per cent of the injected dose retained in the rabbit. Before ring counting, the bladder of the animals was emptied using a rubber catheter, this procedure proving useful in obtaining smooth total body curves. Frequently over 100 ml of urine was removed by catheterising.

Three different types of drinking water were used in these experiments, namely:

1. Tap water containing 0.005% inactive NaI and 0.45% inactive NaCl.
2. Tap water containing 0.005% inactive NaI.
3. Tap water without supplementary NaI or NaCl.

McFarlane used water of type 1 for his $^{131}$I-protein turnover experiments in rabbits, the advantages of which will be further shown below. Water of type 2 is commonly used in metabolic experiments using iodinated proteins in order to reduce the uptake of radiiodide by the thyroid gland. Tap water alone was used here only in a small number of cases for comparative purposes.

**Results**

1. The general shape of plasma and total body disappearance curves of injected $^{131}$I-iodide in healthy rabbits

As may be seen in Fig. 1 above, the semilogarithmic plot of plasma radioactivities is in three sections. The first one (II/a) in which a rapid disappearance of $^{131}$I-iodide from the plasma takes place lasts less than 1 hour. This is mainly due to the distribution of injected activity throughout the $^{131}$I-iodide space but to a small extent also to the beginning of renal excretion of $^{131}$I-iodide. The second section (II/b) is usually exponential and extends over the interval during which most of the radioactivity is excreted. Thereafter a bent section (II/c) follows suggesting protracted release of residual amounts of iodide.