known refractive index in order to control the accuracy and the proper inserting of the paper. The procedure will not take much longer time than a measurement with normal quantities and may be used with all liquids which do not react with the paper. The minimum quantity for a measurement is ¼ – ½ mm³.

1. Abbe, E. *Neue Apparate zur Bestimmung des Brechungs- und Zerstreuungsvermögens fester und flüssiger Körper.* Jena (1874).
2. Löwe, F. *Optische Messungen.* III Aufl. (1939).
3. Gibb, T. R. T. *Optical methods of chemical analysis.* (1942).
4. Abbe, E. *Gesammelte Abhandlungen.* Jena. **2** (1906) 130.
5. Waldmann, H. *Helv. Chem. Acta,* **21** (1939) 1053.
6. Bielenberg, W. *Z. angew. Chem.* **42** (1930) 972.
7. Joffé, B. V. *Compt. rend. acad. sci. URSS.* **LIII** (1946) 433. *J. Gen. Chem. URSS* **16** (1946) 1121.
8. Zeiss Abbe-refraktometer, *Gebrauchsanweisung Mess* 172 G/VIII.
9. Alber, H. K., and Bryant, J. T. *Ind. Eng. Chem. Anal. Ed.* **12** (1940) 305–7.
10. Wilson, C. L. *The Analyst* **71** (1946) 120.
11. Blohm, S. G. *Österreich. Chem. Z.* **6** (1950) 97, *Microchemi vereinigt mit Microchimica Acta,* **XXXVI** (being printed).
12. Pfund, A. H. *J. Optical Soc. Am.* **36** (1946) 95.

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Inability of two Hydantoins to act as Precursors of Pyrimidines in Ribonucleic Acid

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In earlier work we have found that the rat can utilize orotic acid as a precursor for the pyrimidines of polynucleotides [1]. During the course of work on further possible intermediates in the synthesis of polynucleotides in the rat we have investigated the utilization of two N^{15} marked intermediates in the synthesis of orotic from aspartic acid according to Mitchell and Nyc [2] *i. e.* 5-acetylhydantoin and 5(carboxymethylidine)-hydantoin. The latter compound is transformed into orotic acid by alkali under mild conditions. A similar transformation might conceivably be caused by the hydantoinsplitting enzyme recently found in rat tissues by Bernheim and Bernheim [3].

Starting from N^{15} aspartic acid the two hydantoins were synthesized according to the method of Nyc and Mitchell [2]. They contained an over-all excess of 16.2 atom % N^{15}. Each hydantoin was injected subcutanously into two different groups of two rats at a level of 125 mg/kilo of body weight per day. The injections were carried out twice daily with approximately 12 hourly intervals over a period of 3 days. The animals were killed 12 hours after the last injection. In each group the polynucleotides from the pooled livers were prepared and separated into desoxyribo- and ribonucleic acids according to Hammarsten [4]. The pyrimidine nucleosides were prepared from ribonucleic acids according to Reichard [5]. Both the mixed polynucleotides and the pyrimidine ribosides were analyzed for N^{15}.

In no case could a significant incorporation of the isotope be demonstrated thus indicating that none of the two hydantoins had been used for the synthesis of polynucleotide components.

1. Bergström, S., Arvidsson, H., Eliasson, N. A., Hammarsten, E., Reichard, P., and von Ubisch, H. *J. Biol. Chem.* **177** (1949) 495, **179** (1929) 169.
2. Nyc, J. F., and Mitchell, H. K. *J. Am. Chem. Soc.* **69** (1947) 1382.
3. Bernheim, F., and Bernheim, M. C. L. *J. Biol. Chem.* **163** (1946) 683.
4. Hammarsten, E. *Acta Med. Scand.,* Suppl. **196** (1947) 634.
5. Reichard, P. *J. Biol. Chem.* **179** (1949) 763.

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