M. C., *Cancer,* 1956, v9, 1102. Rudali, G., Duplan, J. F., Latarjet, R., *C. R. Acad. Sci.* (Paris), 1956, v242, 837. Furth, J., Buffett, R. F., Banasiewicz-Rodriguez, M., Upton, A., PROC. SOC. EXP. BIOL. AND MED., 1956, v93, 165. Dulaney, A. D., *Cancer Res.,* 1956, v16, 877. Hays, E. F., Simmons, N. S., Beck, W. S., *Nature,* 1957, v180, 1419. Rogel, R., Rudali, G., *Bull. Cancer,* 1958, v44, 483. Kassell, R., Rottino, A., Cancer Res., 1959, v19, 155.

7. Gross, L., *Ann. N. Y. Acad. Sci.,* 1957, v68, 501.

8. Stewart, S. E., Eddy, B. E., Gochenour, A. M., Borgese, N. G., Grubbs, G. E., *Virology,* 1957, v3, 380.

9. Stewart, S. E., Eddy, B. E., Borgese, N. G., *J. Nat. Cancer Inst.,* 1958, v20, 1223.

10. Eddy, B. E., Stewart, S. E., Young, R., Mider, G. B., *ibid.,* 1958, v20, 747.

11. Eddy, B. E., Stewart, S. E., Berkeley, W., PROC. SOC. EXP. BIOL. AND MED., 1958, v98, 848.

12. Eddy, B. E., Rowe, W. P., Hartley, J. W., Stewart, S. E., Huebner, R. J., *Virology,* 1958, v6, 290.

13. Stewart, S. E., Eddy, B. E., *Perspectives in Virology,* 1959, 245, John Wiley and Sons, Publ., New York.

14. Rowe, W. P., Hartley, J. W., Brodsky, I., Huebner, R. J., *Science,* 1958, v128, 1339.

15. Buffett, R. F., Commerford, S. L., Furth, J., Hunter, M. J., PROC. SOC. EXP. BIOL. AND MED., 1958, v99, 401.

16. Mirand, E. A., Mount, D. T., Moore, G. E., Grace, J. T., Sokal, J. E., *ibid.,* 1958, v99, 1.

17. Latarjet, R., DeJaco, M., *C. R. Acad. Sci.* (Paris), 1958, v246, 449.

18. Eddy, B. E., Stewart, S. E., Stanton, W. F., Marcotte, J. M., *J. Nat. Cancer Inst.,* 1959, v22, 161.

19. Stewart, S. E., Eddy, B. E., Stanton, M. F., Lee, S. L., *Proc. Am. Assn. for Cancer Res.,* 1959, v3, 67 (Abstract).

20. Dunn, Th. B., *J. Nat. Cancer Inst.,* 1954, v14, 1281.

21. Schoolman, H. M., Spurrier, W., Schwartz, S. O., Szanto, P. B., *Blood,* 1957, v12, 694.

22. Friend, Ch., *J. Exp. Med.,* 1957, v105, 307.

23. ———, *Perspectives in Virology,* 1959, 231, John Wiley and Sons, Publ., N. Y.

24. Dmochowski, L., Grey, C. E., *Blood,* 1958, v13, 1017.

25. Dmochowski, L., Grey, C. E., Gross, L., *Proc. 7th Intern. Cancer Congress, London,* 1958, 133 (Abstract).

26. Dmochowski, L., *J. Nat. Cancer Inst.,* 1954, v15, 785.

27. Brodsky, I., Rowe, W. P., Hartley, J. W., Lane, W. T., *J. Exp. Med.,* 1959, v109, 439.

28. Huebner, R. J., Rowe, W. P., Gross, L., personal communication.

29. Dmochowski, L., Grey, C. E., Law, L. W., *J. Appl. Physics,* 1956, v27, 1393.

30. Dmochowski, L., Grey, C. E., *Ann. N. Y. Acad. Sci.,* 1957, v68, 559.

31. Dmochowski, L., Grey, C. E., Gross, L., *Radiation Biology and Cancer,* 1959, 382, Univ. of Texas Press, Austin.

32. Bernhard, W., Guerin, M., *C. R. Acad. Sci.* (Paris), 1958, v247, 1802.

33. Bernhard, W., Gross, L., *ibid.,* 1959, v248, 160.

34. DeHarven, E., Friend, Ch., *J. Biophys. Biochem. Cytol.,* 1958, v4, 151.

35. Heine, U. Graffi, A., Helmcke, J. G., Randt, A., *Naturwissensch.,* 1957, v44, 449.

36. Howatson, A. F., McCulloch, E. A., *Nature,* 1958, v181, 1213.

37. Kahler, H., Rowe, W. P., Lloyd, B. J., Hartley, J. W., *J. Nat. Cancer Inst.,* 1959, v22, 647.

Received July 23, 1959. P.S.E.B.M., 1959, v102.

Human Studies of Biologic Availability of Niacin in Coffee.* (25324)

GRACE A. GOLDSMITH, O. NEAL MILLER, WALTER G. UNGLAUB AND KAREN KERCHEVAL
Nutrition-Metabolism Unit, Depts. of Medicine and Biochemistry, Tulane University, New Orleans, La.

Teply *et al.*(1) found that roasted coffee contained about 10 mg niacin/100 g as measured biologically with *L. arabinosis* and later confirmed by rat assay(2). Niacin content increases with degree of roasting; values range from 7 to 46 mg/100 g(2). Coffee has not been considered as a source of niacin in the human diet. In view of its wide use as a beverage, it seemed desirable to determine the biologic availability of niacin in coffee for man. Niacin contributed by coffee might explain certain inconsistencies in epidemiologic studies relating dietary intake of niacin and

* This investigation was aided by grants from Coffee Brewing Inst. and Williams Waterman Fund, Research Corp.

TABLE I. Effect of Coffee on Excretion of Niacin Metabolites in 5 Patients.

Mean daily excretion of niacin metabolites calculated as niacin (mg)		Daily intake of niacin in coffee (mg)	% of added niacin excreted
Basal diet	Basal diet + coffee		
8.5	15.2	11.4	58
6.2	15.0	13.4	66
7.3	12.9	9.6	58
8.7	15.1	13.0	49
8.9	11.3	12.9	19

tryptophan to the incidence of pellagra.

Materials and methods. Five adult subjects, 3 males and 2 females, were placed on control diet which furnished approximately 10 mg niacin and 1000 mg tryptophan daily. After 10 to 14 days, coffee was added to the diet, 4 cups (150 cc each) daily for 10 days. Urinary excretion of niacin metabolites, N^1-Methylnicotinamide (N^1-Me) and the pyridone of N^1-Me (pyridone) were determined in consecutive 48 hour periods with slight modifications of published methods(3,4). Coffee was prepared in a standard manner in electric coffee maker, each cup of beverage representing 10 g coffee. Coffee beverage was analyzed microbiologically for niacin using *L. arabinosis* and was reasonably constant. Dark roast coffee was employed; one cup (150 cc) contained 2.4 to 3.4 mg niacin.

Results. Excretion of niacin metabolites became stabilized at a constant level after 4 days on control diet or a similar period on the diet with coffee added. Mean daily excretion of niacin metabolites (N^1-Me + pyridone) on the last 6 days of each dietary regimen are are given in Table I. The quantity of niacin furnished by coffee and the percent of this niacin excreted in urine as metabolites are also shown. A significant increase in excretion of niacin metabolites occurred in each subject when coffee was added to the diet amounting to 19 to 66%, average 50%, of niacin furnished by coffee. The small increase in subject 5 was due to his failure to consume some foods supplying niacin and tryptophan during period when coffee was administered. In our previous studies addition of 10 to 150 mg of niacinamide to a similar diet resulted in an average increase in excretion of niacin metabolites of 57% of administered dose. It seems evident that niacin in coffee is biologically available for man and that the vitamin is absorbed and excreted in a manner similar to that observed for pure niacinamide.

Comments. Minimal niacin requirement of adults, including niacin formed from tryptophan, is about 9-12 mg daily depending on body size and caloric intake(5). The dark roast coffee used furnished 9.6 to 13.4 mg of niacin daily, enough to meet this requirement. Light roast coffee contains less niacin, approximately 1 mg/cup(1) but could also contribute significant amounts of this vitamin to the diet. The amount of coffee consumed should be considered in estimating daily intake of niacin. Consumption of coffee in some countries in which staple foods are low in niacin and its precursor, tryptophan, may explain, in part, the infrequency with which pellagra is observed in these areas.

Summary. Coffee contains a significant amount of niacin which is biologically available for man. This beverage can furnish an appreciable share of daily requirement of niacin and should be considered in estimating the niacin content of the human diet.

1. Teply, L. J., Krehl, W. A., Elvehjem, C. A., *Arch. Biochem.,* 1945, v6, 139.

2. Teply, L. J., Prier, R. F., *J. Agric. and Food Chem.,* 1957, v5, 375.

3. Huff, J. W., Perlzweig, W. A., *J. Biol. Chem.,* 1947, v167, 157.

4. Rosen, F., Perlzweig, W. A., Leder, I. G., *ibid.,* 1949, v179, 157.

5. Goldsmith, G. A., *Am. J. Clin. Nutrition,* 1948, v6, 479.

Received July 24, 1959. P.S.E.B.M., 1959, v102.