dance of the labile, antineuritic substance resulted in a pellagra-like disease in the rat. Following the arrest of growth, alopecia and bilateral symmetrical lesions of the skin were the most noteworthy symptoms noted. Although the work of Goldberger and associates has in the main been substantiated in this country and England, Salmon, Hays and Guerrant,[5] and Chick and Roscoe[6] have suggested the complicity of the antipellagric dietary essential, since occasionally animals deprived of this syndrome remain stunted in growth but exhibit no skin lesions.

During the past two years, while engaged in studies of the biochemistry and pathology[7] of the pellagra-like avitaminosis in the albino rat, we have had occasion to observe various manifestations of the so-called vitamin G deficiency in 125 animals. The disease was produced by one of us (B. S.) on a dietary régime described elsewhere.[8] The optimum ration for the production of the dermatitis was found to be one deficient in the vitamin B complex, supplemented by a daily allowance of 500 mg of rice polishings, irradiated for 10 hours, according to the suggestion of Hogan and Hunter,[9] in order to insure the destruction of the greater portion of vitamin G. To summarize our results of 1929, the majority of the animals in which pellagra-like symptoms were produced showed dermatitis 20 to 50 days preceding the cessation of growth. On the other hand, our experience with other vitamin G deficient diets has been that the majority of animals failed in growth markedly without any accompanying skin lesions; and we would like to point out in this connection that all our rations were amply fortified with the antineuritic, growth-promoting factor. We have repeated our experiments of 1929 and have corroborated our former findings that there is no relation between failure in growth and the incidence of pellagra-like symptoms in the rat, the dermatitis being prevalent in some animals that make normal growth and absent in others that are first stunted in growth for weeks and months, and that finally collapse following great losses of weight. Recently we found accentuated dermatitis in six positive controls, out of 12 studied, accompanying excellent growth, the males having attained a weight of 240 to 270 grams and the females a weight of about 200 grams. The rations of the positive controls contained 10 per cent. autoclaved yeast as a source of vitamin G, and irradiated rice polishings as a source of vitamin B. Since we autoclave our yeast (Northwestern) at 20 pounds pressure for 6 hours, it is quite possible that, under our conditions, we are destroying the greater portion of the antidermatitis factor, at the same time not injuring the relatively stable growth-promoting factor. We, therefore, conclude that the so-called vitamin G is composed of two dietary essentials: one the deficiency of which produces pellagra-like symptoms in the rat; and another the deficiency of which produces a decline of growth.

Since the nomenclature of the so-called antipellagric factor is still in a state of confusion, the English investigators calling it vitamin B_2, while the American biochemists refer to it as vitamin G, the letter F of the vitamin alphabet having been left unrepresented,[10] we suggest a logical home for the letter F and have it indicate the stable growth-promoting factor associated with the vitamin B complex, and that we retain the letter G for the antipellagric factor, the deficiency of which produces the characteristic skin lesions in the rat.

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LIVER EXTRACT AS A SOURCE OF VITAMINS B AND G[1]

SOME of the early investigations of the distribution of vitamins showed that the livers of animals were a good source of vitamin B (vitamin B + G). More recently liver and liver extracts have been widely used in the treatment of pernicious anemia.

Curtis and Newburgh[2] last year reported some feeding tests with liver extract. They found that when 2 per cent. of liver extract (Lilly) was added to a basic diet containing no other source of vitamin B, growth and energy ingestion were approximately normal; the replacement of liver extract by equal amounts of yeast vitamin powder (Harris) caused less growth and less energy ingestion. If the liver extract was autoclaved before feeding, all the experimental animals developed polyneuritis. These tests indicated that liver extract was a good source of both vitamins B and G but gave no information regarding the relative richness of the substance in the separate factors.

[5] Salmon, Hays and Guerrant, *J. Inf. Dis.*, 1928, 43: 426–441.
[6] Chick and Roscoe, *Biochem. J.*, 1927, 21: 698.
[7] Thatcher and Sure, Arch. of Path., in press.
[8] Thatcher, Sure and Walker, *So. Med. J.*, 1930, 23: 143.
[9] Hogan and Hunter, *J. Biol. Chem.*, 1928, 78: 433–445.
[10] Report of Committee on Nomenclature of American Society of Biological Chemists, SCIENCE, 1929, 69: 276.
[1] Read before the Biological Section, Alabama Academy of Science, Auburn, Alabama, April 18, 1930.
[2] A. C. Curtis and L. H. Newburgh, "The Effect of Liver and Liver Extract upon Appetite," *Jour. Clin. Inv.*, 7: 518, 1929.

We were primarily interested in determining whether one of the commercial liver extracts[3] would offer a good source of vitamin G for further concentration of the active factor.

EXPERIMENTAL

Rats averaging 45 gms in weight were fed Diet 2B consisting of extracted casein 18, salts (No. 186) 3.7, agar 2, corn starch 69.3, butterfat 5, and cod-liver oil 2 parts for a preliminary depletion period of two weeks. The rats were fed in groups during this preliminary period; they were then placed in individual cages and given the test material, fed separately from the basal diet. Preliminary tests on 0.05 and 0.10 gm of liver extract per rat daily indicated that these dosages did not furnish a sufficiency of vitamins B and G for normal growth; on the 0.05 gm dosage there was rapid development of beriberi; even on 0.10 gm there was eventual development of beriberi. Later tests were conducted on daily dosages of 0.10 and 0.20 gm both with and without an added vitamin B supplement. The vitamin B supplement was prepared by adsorbing on fuller's earth the vitamin B from a concentrated alcoholic (80 per cent. alcohol by weight) extract of white corn.[4] Tests were simultaneously conducted upon a high-grade brewer's yeast for comparison. The average gain per rat during a period of nine weeks following the two weeks' preliminary period is shown below.

AVERAGE GAIN PER RAT FOR NINE-WEEK EXPERIMENTAL PERIOD

	Gms
0.10 gm liver extract	3.0
0.20 gm liver extract	65.0
0.10 gm liver extract plus 0.05 gm vitamin B solid	172.0
0.20 gm liver extract plus 0.05 gm vitamin B solid	165.0
0.05 gm brewer's yeast	21.0
0.10 gm brewer's yeast	53.0
0.10 gm brewer's yeast plus 0.05 gm vitamin B solid	51.0
0.20 gm brewer's yeast plus 0.05 gm vitamin B solid	72.0
0.05 gm vitamin B solid	11.0

It is evident that the liver extract tested is an excellent source of vitamin G, 0.10 gm per day furnishing a sufficiency of this factor for normal growth of the rat through an experimental period of nine weeks. It is not such a good source of vitamin B; 0.10 gm per rat daily as the sole source of this factor produces some increase in weight for a few weeks but the initial increase is followed by a decline in weight and the onset of beriberi. The liver extract tested apparently contained four or five times as much vitamin G but only about one fifth as much vitamin B as the sample of brewer's yeast. The vitamin B content of the extract compared favorably with the vitamin B content of the pure dried baker's yeast which we commonly obtain on the market.

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[3] The extract (No. 343) was kindly furnished by Eli Lilly and Company.

[4] W. D. Salmon, N. B. Guerrant and I. M. Hays, "The Effect of Hydrogen Ion Concentration upon Adsorption of the Active Factors of Vitamin B Complex by Fullers' Earth," *Jour. Biol. Chem.*, 80: 91, 1928.

BOOKS RECEIVED

Abhandlungen der Medizinischen Fakultät der Sun Yatsen-Universität. I Band 2, 3 und 4 Heft. Pp. xi + 295. 114 figures. II Band 1 Heft. Pp. 126. Verlag der Sun Yatsen-Universität, Canton.

DE ALBENINO, NICOLAO. *Verdadera relacion delo sussedido enlos Reynos e prouincias del Peru desde la yda a ellos del Virey Blasco Nuñes Vela hasta el desbarato y muerte de Gonçalo Piçarro (Sevilla, 1549).* Institut d'Ethnologie, Paris. 45 fr.

BURTON, WILLIAM W. *Plane Trigonometry.* Pp. x + 125 + 93. 65 figures. Thomas Y. Crowell. $2.50.

COLE, LAWRENCE W. *Factors of Human Psychology.* Second edition, revised. Pp. 612. 42 figures. University of Colorado Press.

FENNEMAN, NEVIN M. *Physiography of Western United States.* Pp. xiii + 534. 172 figures. McGraw-Hill. $5.00.

FLINT, RICHARD F. *The Glacial Geology of Connecticut.* Bulletin No. 47. Pp. 294 + vii. 64 plates and 40 figures. Connecticut State Geological and Natural History Survey. $2.00.

GINZBURG, BENJAMIN. *The Adventure of Science.* Pp. xvi + 487. Simon and Schuster. $5.00.

GRIAULE, MARCEL. *Le Livre de Recettes d'Un Dabtara Abyssin.* Pp. x + 180. 140 figures. Institut d'Ethnologie, Paris. 70 fr.

HOLT, EDWIN B. *Animal Drive and the Learning Process.* Volume I. Pp. vii + 307. Supplementary essay. This Material World, by Harold C. Brown. Holt. $2.50.

JEANS, SIR JAMES. *The Universe Around Us.* Second edition, revised. Pp. x + 351. Illustrated. Macmillan. $4.50.

LAHEE, FREDERIC H. *Field Geology.* Third edition. Pp. xxxi + 789. 538 figures. McGraw-Hill. $5.00.

Records of the South Australian Museum. Volume IV. No. 2. Pp. 145–273. Illustrated. Public Library, Museum and Art Gallery of South Australia, Adelaide, South Australia. 10s/6.

SCHUCHERT, CHARLES. *Outlines of Historical Geology.* Second edition. Pp. v + 348. 157 figures. Wiley. $3.00.

STERN, BERNHARD J. *Lewis Henry Morgan, Social Evolutionist.* Pp. ix + 221. University of Chicago Press. $2.50.

THOMPSON, HOMER C. *Vegetable Crops.* Second edition. Pp. ix + 560. 59 figures. McGraw-Hill. $5.00.

Tôhoku Imperial University. Science Reports. First series: Mathematics, Physics and Chemistry. Volume XIX, No. 4: Pp. 365–472. 3 plates; No. 5: Pp. 473–680. 7 plates. Maruzen Company, Tokyo.

WEYL, VON HERMANN. *Gruppentheorie und Quantenmechanik.* Pp. xi + 366. Verlag Von S. Hirzel, Leipzig.