After releasing cock *3*, kerosene is placed in the manometer to level *e*. Then *B* is adjusted level with *2* which is a glass tube drawn to a suitable capillary point. Cock *6* is closed, *7* being already closed with fluid in the burette to the 50 cc mark. Cock *1* is released and the spirometer connected to the egg chamber by the three-way cock *9*. By opening cock *8* the manometer is adjusted to zero, at which time barometric and temperature readings are taken.

The CO_2 is absorbed in the egg chamber and as oxygen is consumed a negative pressure results, as will be indicated by the manometer. But if *B* is properly adjusted on a level with *2* the oxygen used will be immediately replaced with fluid from the volumetric flask flowing into the burette. Thus the oxygen consumption may be read at any time by the fluid level in the burette.

The readings are made at some selected age hour interval. About thirty seconds before the hour the manometer is adjusted to zero by either letting in or drawing out fluid as the case needs be. The zero reading is maintained as the hour strikes, at which time the fluid level in the burette is noted, then immediately the barometric and temperature readings are taken. With the data in hand the oxygen consumed may be reduced to standard readings.

The separatory funnel serves as a reservoir. When the burette is filled near its limits, cocks *6* and *7* are opened and the surplus fluid drained in to *D*, the oxygen being automatically displaced from *D* into *C*. When *D* is filled the fluid is displaced with oxygen from the supply tank as at the beginning of the experiment. The fluid is measured and replaced in the volumetric flask, the same fluid being used repeatedly.

During the first five days of incubation the 50 cc burette will take care of the entire oxygen consumption. In the last half of incubation the rate of oxygen consumption of the egg rapidly approaches 40 to 50 cc per hour, which it reaches just before hatching. When the oxygen consumption is likely to be more than the measuring capacity of the burette during the absence of the observer, the cocks *6* and *7* are left open, allowing the fluid to flow into *D*. On the observer's return the fluid may be displaced with oxygen and measured. Care must always be taken to first adjust the manometer reading to zero and to note barometric and temperature readings at the same time any fluid measurement is made. The egg chamber is of sufficient size to permit the spirometer to be shut off for a short period without disturbing the physiological control.

The advantage of this spirometer is that it permits fairly accurate measurements of rapidly varying rates of oxygen consumption. The measurements may be made over an entire biological period. This is very advantageous in studies of ontogenetic energy. I feel that the principle may be used for studies of oxygen consumption in tissue cultures, insects and small mammals or vertebrates.

ERNEST B. HANAN

DEPARTMENT OF ANATOMY,
SCHOOL OF MEDICINE,
UNIVERSITY OF BUFFALO

SPECIAL ARTICLES

COW'S MILK AS A SOURCE OF VITAMIN B FOR LACTATION

IN 1924 I produced experimental evidence[1] that a ration containing 50 per cent. skimmed milk powder as the only source of vitamin B was inadequate for rearing of young when lactating rats were allowed litters of six young to nurse. When such diets, however, were fortified with a brewer's yeast concentrate entire failure was changed to complete success in lactation.[2] The conclusion was then made that the vitamin B requirements for lactation are much greater than those for growth, and that cow's milk is deficient in vitamin B for milk secretion. Since no method is available for collecting the milk secreted by a rat, the criterion for successful lactation used by all nutritional investigators is the character of growth of the nursing young when a specific dietary essential is the only limiting factor in a ration. In 1927, using diets (provided with a satisfactory salt mixture containing an abundance of ferric citrate) composed of purified food substances, I demonstrated that the vitamin B requirements for lactation are at least three times those necessary for normal growth.[3] Recently I have developed quantitative biological methods for studies of lactation and vitamin requirements of nursing young of the albino rat[4] which have disclosed the fact that the great requirements of vitamin B for lactation are due to the lactating mother's dissipating over 60 per cent. of the vitamin in the metabolism of transfer to the milk. My methods involve transfer experiments from stock diets to purified synthetic

[1] B. Sure, *J. Biol. Chem.*, 1924, 62: 371–396.

[2] Since these milk diets were fortified with ferric citrate, iron was ruled out as a limiting factor in failure of lactation. That copper, another mineral element deficient in milk, is not a complicating factor in the vitamin B lactation problem has also been recently demonstrated. See *J. Biol. Chem.*, 1928, 80: 289–295.

[3] *J. Biol. Chem.*, 1927, 74: 55–69.

[4] *Ibid.*, 1928, 76: 685–700.

diets complete in every respect with the exception of the vitamin to be investigated. The lactating mother must first be entirely depleted of all storage from the previous dietary régime before any vitamin-containing material may be subjected to biological assay. Unless depletion is first secured, all such transfer experiments yield nothing but irregular and in many instances absolutely erroneous results.

My results on the great requirements of vitamin B for lactation have been substantiated by the work of Macy and coworkers[5] and by Evans and Burr.[6] Daniels, Jordan and Hutton[7] have, however, recently introduced confusion in the literature and it is the purpose of this communication to point out to the latter investigators the reasons for their conflicting evidence. In the first place, Daniels and coworkers after making their transfer experiments from stock diets have failed to deplete the lactating mothers from vitamin reserves. The second point of weakness lies in their dietary management. Instead of proceeding with a diet complete in every respect with the exception of the vitamin B factor, they attempt to feed liquid or dry milk as the sole source of a maternal ration for lactation. In this connection it may be pointed out that Daniels and coworkers[8] have recently made definite conclusions, employing the lactation method of biological assay, on the destruction of vitamin B in evaporated milk, in which study they used a ration consisting of casein, bread, cod-liver oil, ferric citrate and potassium iodide —another diet deficient in more than one factor, *i.e.*, minerals. Such technique could not possibly lead to results worthy of conclusions of any consequence. The third error these investigators have made is the departure from the standard technique of using four instead of six young in the litter. Since seven to eight young is the average size of a litter of the albino rat, six young would certainly be a more accurate and severer test than four young. The conclusion of Daniels *et al.* that "it would seem that any food which can furnish enough of the antineuritic vitamin for the development of four suckling rats must contain enough for the normal human infant" has no basis for consideration. Although the young rat grows about twenty-five times as fast as the baby, the baby weighs about 650 times as much as the rat at birth, and approximately 300 times as much as the rat at weaning. Besides, final deductions with regard to the rôle of vitamin B in infant nutrition, especially dosage, must come from the clinicians.[9]

BARNETT SURE
DEPARTMENT OF AGRICULTURAL CHEMISTRY,
UNIVERSITY OF ARKANSAS

THE NATIONAL ACADEMY OF SCIENCES. II

The preparation of an active extract of the suprarenal cortex: W. W. SWINGLE and J. J. PFIFFNER (introduced by E. G. Conklin).

Studies on an active extract of the corpus luteum: J. J. PFIFFNER (introduced by E. G. Conklin).

On the use of oblate ellipsoids for the measurement of magnetic susceptibility in anisotropic substances: DONALD FOSTER (introduced by C. J. Davisson). If the results of magnetic measurements are to be independent of the exterior form of the specimen, it is necessary to produce uniform magnetization and to determine the intensity of the effective magnetic field inside the material. These two requirements introduce fundamental and persistent difficulties in all magnetic measurements. Uniformity of magnetization of a body placed in a uniform field requires that the surface of the body be of the second degree. The field intensity is then calculable for certain directions of magnetization. On this account, the ellipsoidal form of specimen is unique; and it has been commonly used, especially for measurements on single crystals. When oblate ellipsoids are used the susceptibility may be measured in various directions while employing only one specimen. It is shown in this paper that the results of such measurements are ambiguous because they depend on the orientation of the minor axis of the ellipsoid with respect to the crystallographic axes. As an example, it is shown from published data on iron crystals that the I, H curves for a given crystallographic direction in different ellipsoids may differ as much as do the curves for different directions. The difficulty may be avoided by using crystals in the form of straight wires.

On the polarization of X-radiation: WILLIAM DUANE. Previous papers have described experiments with X-rays produced when electrons impinge against free atoms in a gas. This paper describes experiments on the polarization of the X-rays. The details of the researches may be found in the November, 1929, number of the *Proceedings* of the National Academy. The results indicate that, even when all the electrons have practically the same speed

[5] I. C. Macy, J. Outhouse, A. Graham and M. L. Long, *J. Biol. Chem.*, 1927, 73: 189–201.
[6] H. M. Evans and G. O. Burr, *ibid.*, 1928, 76: 263–273.
[7] A. L. Daniels, D. Jordan and M. K. Hutton, *J. Nutr.*, 1929, 2: 19–29.
[8] A. L. Daniels, M. L. Giddings and D. Jordan, *J. Nutr.*, 1928, 1: 455–466.
[9] R. J. Hoobler, *J. Am. Med. Ass'n.*, 1928, 91: 307–310; R. H. Dennett, *ibid.*, 1929, 92: 769–772; J. I. Waring, *Am. J. Dis. Child.*, 1929, 38: 52–57; A. P. Bloxsom, *Am. J. Dis. Child.*, 1929, 37: 1161–1169; S. V. Haas, *Arch. Ped.*, 1929, 46: 467–479; G. W. Bray, Roy. Soc. Trop. Med., *Hyg. Trans.*, 1928, 22: No. 1, 9–42.