e.g., on p. 285, line 14, for "from the substance," read, "by the substance"; in line 17, for "Indian hen," read, "turkey hen"; line 29–30, for "or that something . . . eggs," read, "or that something analogous (to the chalazae) has been laid down, as in the smallest eggs" (*aut analogon quid esse positum, ut in minimis ovis*); line 34, *turrita* is probably the wild pigeon; line 38—p. 285, line 1, for "that all agree . . . eggs," read, "that it is reasonable to believe that chalazae are present in all eggs; line 1, for "I exclude," read, "I have refrained from observing"; line 9, for "two," read, "too." Dr. Meyer says on p. 287 that Fabricius believed that the seminal material of "vipers" is slight in quantity; Fabricius makes that statement of vivipara.

Harvey receives somewhat briefer treatment than Fabricius. Highmore is mentioned briefly, and Descartes is justly reprimanded for having "set a bad example, indeed, for men of science" by his "loose generalizations." Walther Needham, Malphigi, Kerckring, Kuhlemann and Haller pass in review, and then comes a splendid, extensive account of John Hunter's work on the development of the goose egg. Caspar Friedrich Wolff's, von Baer's and Purkinje's contributions form a fitting climax.

In the last chapter the author cites a number of interesting facts to support his contention that "Experimentation—is not the child of to-day," and to disprove the statement that "until 1859 embryologists were content to follow changes in form."

The book is illustrated by 97 figures, admirably selected, but in some instances indifferently reproduced. Fig. 91, taken from Plate VIII of Pander's "Beiträge zur Entwickelungsgeschichte," etc., has unfortunately been reversed by the printer, and the legend attributes it to von Baer. The few typographical misprints are of no serious consequence, neither is the omission of a few works from the bibliography.

While the more important slips of the pen have been pointed out, it should be emphasized that they do not seriously impair the value or importance of Dr. Meyer's fine book. It is a work which supplements admirably Needham's "History of Embryology"; this reviewer welcomes its appearance.

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SPECIAL ARTICLES

ALCOHOL TASTE THRESHOLDS AND CONCENTRATIONS OF SOLUTION PREFERRED BY RATS

In a previous study[1] it was found that rats whose only access to fluid was in the form of an 8 per cent. alcohol solution drank the same total volume as a control group of rats which had access only to tap water. No abnormal behavior was observed and the rate of growth and the activity curves were the same. The experimental animals reduced their food intake, as measured in calories, in proportion to the caloric value of ingested alcohol, thereby maintaining a caloric value equal to the number of calories ingested by control rats on the standard diet. It was further reported that rats restricted in fluid to a 16 per cent. solution of alcohol differed from the 8 per cent. group only by slightly decreased activity and a reduced total volume of fluid intake. The animals refused to take more alcohol in grams than the first group obtained from the 8 per cent. solution. The fact that the rate of growth and activity curves were normal for many months when the alcohol replaced from one fourth to one third of the stock diet demonstrated that alcohol served as a food.

Since publication of the above study on alcohol, numerous instances of beneficial regulatory activities of rats have been reported. Thus, it was found that adrenalectomized rats maintained a constant internal salt environment and kept themselves alive by ingesting large amounts of salt;[2] similarly, parathyroidectomized rats ingested large amounts of calcium solution and thus kept themselves free from tetany.[3] Rats even make beneficial selections when allowed to select their entire diet from purified (or nearly purified) substances.[4]

Using a technique originally devised to determine the taste thresholds of rats for such substances as salt,[5] sugars,[6] etc., we have obtained further information regarding the ability of rats to regulate their alcohol intake. These results throw more light also on the nutritional value of alcohol. In these experiments the rats, kept on our standard McCollum diet, had access for several weeks to two graduated bottles filled with distilled water. Intake from each bottle was recorded daily. When the intake from each bottle had reached a fairly constant level, we put a subliminal concentration of alcohol solution (0.01 per cent. by weight) in one bottle. Thereafter each day we increased the concentration in small steps. Fig. 1 gives the record of one of the animals. The ordinates indicate fluid intake in cubic centimeters; the abscissae

1 Curt P. Richter, *Jour. Exp. Zool.*, 44: 387, 1926.

2 Curt P. Richter, *Am. Jour. Physiol.*, 115: 155, 1936.

3 Curt P. Richter and John F. Eckert, *Endocrinology*, 21: 50, 1937.

4 Curt P. Richter, L. Emmett Holt, Jr., and Bruno Barelare, Jr., *Am. Jour. Physiol.*, 122: 734, 1938.

5 Curt P. Richter, *Endocrinology*, 24: 367, 1939.

6 Curt P. Richter and Kathryne H. Campbell, *Am. Jour. Physiol.*, 128: 291, 1940.

indicate time in days, and also the concentrations of the alcohol solutions offered each day. The record does not show the 10-day preliminary period during which

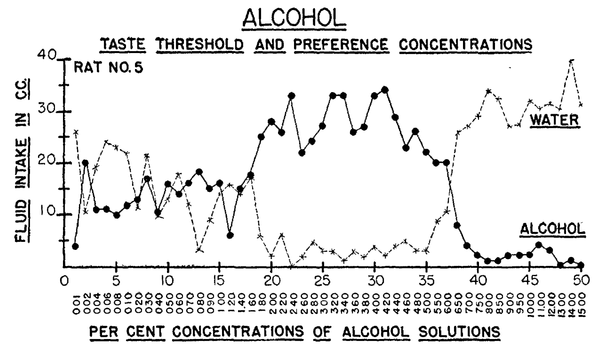

FIG. 1.

both bottles were filled with distilled water. For the first 18 days, when the concentrations increased from 0.01 per cent. to 1.4 per cent., the rat drank almost equal amounts of distilled water and of the alcohol solution. However, it showed a preference for the 1.8 per cent. and for all concentrations up to 4.8 per cent. It drank large amounts of these solutions and small amounts of water. It showed its greatest preference for alcohol solutions from 2.4 per cent. to 4.4 per cent. With higher concentrations its preference decreased. It still showed a slight preference for the 6.0 per cent. alcohol solution, but preferred distilled water to alcohol solutions in all higher concentrations. It drank only minimal amounts of any alcohol solution above 7.0 per cent. Thirteen out of seventeen rats had similar records; three never manifested a preference for alcohol; one preferred water to the alcohol.

The results of some of our previous experiments may throw some light on the significance of these results. Thus far we have found that rats showed preferences for certain concentrations of solutions of substances, such as glucose, maltose, sucrose, galactose, sodium chloride, potassium chloride and dibasic sodium phosphate, all of which are known to play an important part in nutrition. The rats preferred distilled water to poisonous substances, such as mercuric chloride, arsenic trioxide and morphine sulfate, even when offered in extremely low concentrations. These experiments demonstrate that, according to the rats' appetite, alcohol belongs to the group of substances that play a part in normal nutrition.

Further experiments are in progress to determine the effects produced on alcohol taste threshold and maximum preference concentrations by removal of the olfactory bulbs, surgically induced brain lesions, dietary deficiencies, glandular deficiencies and forced alcohol feeding over long periods of time. After long forced alcohol feeding will rats have a higher or lower threshold for alcohol and will they prefer alcohol to water in concentrations above 6 per cent.? This might give a quantitative measure of any addiction to alcohol.

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THE SYNTHESIS OF NICOTINIC ACID IN THE BODY OF SHEEP[1]

ON the basis of growth, evidence[2] has been presented indicating that nicotinic acid is not a dietary essential for sheep. It has recently been shown that dogs restricted to a typical blacktongue-producing diet after about 28 days virtually cease to excrete nicotinic acid in the urine.[3] Rats remain free from deficiency disease when restricted to a diet that is deficient in nicotinic acid only. They continue, however, to excrete appreciable amounts of nicotinic acid in the urine even after being on the deficient diet for long periods of time.[3]

Since species which require nicotinic acid cease to excrete it when on a deficient diet, its occurrence in the urine of animals restricted to such a diet indicates that it is synthesized in the body. Lambs approximately 3 months of age were placed on a nicotinic acid-deficient diet consisting of regenerated cellulose 20, brewer's rice 49.5, purified casein 9, corn 16, cow peas 2.5, salts mixture 3 and oleum percomorphum weekly to furnish vitamins A and D. Dogs fed this diet, with the modification that the cellulose was omitted, showed a marked decrease in their urinary nicotinic acid and developed typical blacktongue symptoms. After the lambs had been on the experimental diet approximately 8 months the urine was collected for the estimation of nicotinic acid. The nicotinic acid was determined photometrically on unhydrolyzed samples of urine by the cyanogen bromide-aniline reaction.

The figures in the table for the urinary excretion of

Number	Diet	Total per day	Per kg. wt. per day
		mg	mg
418	Deficient	2.52	0.13
420	"	5.33	0.39
488	"	2.81	0.12
443	"	1.95	0.08
443	Deficient + 1 mg n.a./kg wt./day for 13 days	2.86	0.12
443	Deficient + 2 mg n.a./kg wt./day for 5 days	3.00	0.13
443	Deficient + 4 mg n.a./kg wt./day for 13 days	5.16	0.22
3261	Alfalfa hay and grain	2.76	0.09
3439	" " " "	5.74	0.21
523	" " " "	3.23	0.14

[1] Published with the approval of the director of the Texas Agricultural Experiment Station as Technical Contribution No. 592.

[2] P. B. Pearson, H. Schmidt and A. K. Mackey, *Proc. Soc. Exp. Biol. and Med.*, 40: 423, 1939.

[3] L. J. Harris and W. D. Raymond, *Biochem. Jour.*, 33: 2037, 1939.