at 37.5°C for 26 days. Morphologically and tinctorially the recovered culture was identical to the organism used as the inoculant. Likewise a chromogenic acid-fast bacillus was cultured from the liver of the rabbit from Group 1, requiring 18 days before visible growth was noted. Cultures were not recovered from the control animals of Groups 3 and 4. Although Duval and Harris[2] pointed out that saprophytic acid-fast microörganisms produce lesions in the experimental animal following repeated massive doses 4 to 6 weeks after the last injection, no lesions were noted in any of our control animals, 4 months after the last injection.

Summary. The recent chrome acid-fast culture produces lesions in the rabbit that grossly and microscopically resemble those seen in human leprosy. Here, the lesion is definitely progressive over a period of 4 or more months. During this period it is noteworthy that the exciting microörganism steadily increases in number. The "foamy" cells are crowded with dense colony-like masses of the specific bacillus. The chromogenic acid-fast bacillus was recovered in culture from the lesions of the animals 4 months following the last injection. The isolation of the bacillus used in the experiment was more difficult from the lesions that were 4 months old than from the earlier lesions. Visible growth occurred only after 4 weeks' incubation. In the control animals no gross or microscopic lesions were noted 4 months after the last inoculation. The cultures inoculated with material from these animals remained sterile after 4 weeks' incubation.

10505 P

Control of Vitamin K Therapy. Compensatory Mechanisms at Low Prothrombin Levels.*

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The use of vitamin K to combat the lowered plasma prothrombin level in jaundiced bleeders[1, 2] has created a demand for a simple

2 Duval, C. W., and Harris, W. H., *J. Med. Res.*, 1913, **23**, 165.

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1 Warner, E. D., Brinkhous, K. M., and Smith, H. P., PROC. SOC. EXP. BIOL. AND MED., 1938, **37**, 628; *Am. J. Med. Sci.*, 1938, **196**, 50.

2 Butt, H. R., Snell, A. M., and Osterberg, A. E., *Proc. Staff Meetings of the Mayo Clinic*, 1938, **13**, 65; *ibid.*, 1938, **13**, 753.

clotting test. Quick[3] has suggested the use of whole blood as a test for thromboplastic activity; we propose to reverse the procedure, and use thromboplastin, in large amounts, to test the clotting power of whole blood. We also propose to show that deficiency in prothrombin can be compensated in part by changes in other factors.

The test. In a 3 cc tube is placed 0.1 cc thromboplastin. Blood, freshly drawn, is run into the tube to a 1.0 cc mark, then inverted once, and tilted gently every few seconds, and the clotting time observed. The test is repeated on a normal individual, and the unknown expressed in percentage of the normal.

$$\text{Clotting activity (in \% of normal)} = \frac{\text{Clotting time of the normal}}{\text{Clotting time of the unknown}} \times 100$$

For example, a patient's blood clotted in 60 seconds, a control in 30. Activity, therefore, was 50% of normal.

To prepare thromboplastin, extract 10 g ground brain or lung (ox or rabbit) 2 hours with 10 cc saline; strain, and preserve in ice box. Variable potency does not affect the clotting time ratio of unknown to control. If normal values exceed 60 seconds, the thromboplastin is rejected; if less than 25 seconds one should dilute the thromboplastin with saline.

Results. Table I shows results on 10 cases selected at random from our series. The prothrombin levels obtained by the 2-stage titration procedure developed in this laboratory[4] serve as a standard. It is seen that the values obtained with the new test usually agree within 15% with the true prothrombin levels, indicating that the new test is dependent in large part upon the prothrombin concentration.

When prothrombin falls below the level of 30-50% a bleeding tendency appears. Above this level blood clots at a normal rate (6-10

TABLE I

Diagnosis	Sex	New test (in % of normal)	Quantitative prothrombin test (in % of normal)
Pernicious Anemia	F	100	98
Aplastic "	M	93	83
Cholecystitis	F	90	92
Obstr. Jaundice	M	76	80
" "	M	62	73
" "	M	60	60
Biliary Fistula	F	50	49
Obstr. Jaundice	M	41	46
"Toxic Hepatitis"	M	31	23
Obstr. Jaundice	M	22	13

[3] Quick, A. J., *Am. J. Physiol.*, 1936, **114**, 282.

[4] Warner, E. D., Brinkhous, K. M., and Smith, H. P., *Am. J. Physiol.*, 1936, **114**, 667; *J. Exp. Med.*, 1937, **66**, 801.

min.), suggesting, we believe, that other factors vary to compensate for any prothrombin deficiency which may exist. In one case, not listed in the table, the new test consistently gave normal values, whereas the 2-stage titration showed that the prothrombin was, in reality, 50% of normal. Since thromboplastin is eliminated as a variable by the test, it follows that some other factor varied, permitting thrombin to be formed with normal speed[5] despite a deficiency in prothrombin. In most cases, however, the new test, by eliminating thromboplastin variations, gives values corresponding to the true prothrombin level. This suggests that thromboplastin itself may vary in amount, effecting compensation.

The new test, like the "prothrombin test" of Quick,[3] measures not prothrombin alone, but the summation of several variables, and it thus supplies a practical measure of the tendency to bleed. It is a simplification of his test, in that thromboplastin is added directly to whole blood instead of to plasma. This eliminates centrifugalization, recalcification, and titration. It is a bedside test which we have found to be useful as a guide for vitamin K therapy.

10506 P

Effect of Riboflavin-low Diets upon Nerves, Growth, and Reproduction in the Rat.*

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While investigating the nervous system of growing chicks maintained on a riboflavin-low diet (Phillips and Engel[1, 2]) it was discovered that severe degeneration occurred in the myelin sheaths of the spinal cords and the peripheral nerves. The purpose of this study was to determine whether similar nervous system changes would occur in the rat raised under similar dietary conditions.

[5] Warner, E. D., Brinkhous, K. M., and Smith, H. P., PROC. SOC. EXP. BIOL. AND MED., 1939, **40**, 197.

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[1] Phillips, P. H., and Engel, R. W., *Poul. Sci.*, 1938, **17**, 463.

[2] Phillips, P. H., and Engel, R. W., *J. Nutr.*, 1938, **16**, 451.