

mature oat grass prompted an investigation of this material. The young oat leaves proved to be a better source of gonadotropin than alfalfa leaf, and more easy to obtain at the desired stage of growth. The plants were cut when 4 to 6 inches high and either cured in the sun or quickly dehydrated by the method commonly used for drying alfalfa commercially. Two crops were obtained from Kansas and 2 from the New Jersey State Agricultural Experiment Station at New Brunswick.† The extraction procedure has been modified to the extent of substituting 30% acetone for water as the medium for the extraction of the crude protein resulting from the benzoic acid precipitation.

Potent extracts have been repeatedly prepared from each of the 4 successive crops over a period of 3 years. With the present technique the dried oat leaves yield products which produce ovulation in the rabbit by the single intravenous injection of the equivalent of 30 to 80 gm. of the original dry leaf. The latent period, like that of post-coital ovulation, is less than 18 hours and thus differs from the process provoked by the injection of copper salts.³ It is entirely possible that the activity in alfalfa and oat leaves is similar to the thermolabile component in yeast extracts which was found to be active in the hypophysectomized male rat by Hisaw and coworkers.⁴

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Hyperthyroidism and Vitamin C.*

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Recently this laboratory has demonstrated that crystalline vitamin B₁, when administered in large doses will prevent the rapid tissue catabolism and even permit considerable growth in hyperthyroidism in the rat, provided the diet was fortified with an abundance of the stable factor of the vitamin B complex.¹

† The Kansas product was supplied by Dr. Schnabel; the New Jersey samples were supplied through the courtesy and cooperation of Dr. Walter Russell without whose aid these experiments would have been impossible.

³ Fevold, Hisaw, and Greep, *Am. J. Physiol.*, 1936, **117**, 68.

⁴ Hisaw, Greep, and Fevold, *Anat. Rec.*, 1936, **67**, supp. p. 50.

* Research paper No. 476, Journal Series, University of Arkansas, Fayetteville.

¹ Sure, B., and Buchanan, K. S., *J. Nutr.*, 1937, **18**, 513.

During the past 18 months we have been investigating oxidation-reduction efficiency in avitaminosis, which included studies of ascorbic acid concentration in blood, tissues, and endocrine glands. Although it is claimed that the rat either synthesizes vitamin C or requires such minimum amounts that are undetectable by available micro-methods, we are finding appreciable reduction of this vitamin in certain tissues in vitamin B₁ deficiency, thus establishing a definite vitamin interrelationship.

In continuing with the problem of the antithyrogenic action of vitamin B₁ and the possible supplementary value of riboflavin to a ration supplying the stable components of the vitamin B complex in the form of autoclaved beef, it was thought of interest to determine the influence of hyperthyroidism on the ascorbic acid or vitamin C† content of various tissues and endocrines. The experiments were carried out in two series: (1) Five sets in groups of 3 and (2) four sets in groups of 4. The animals were 34 to 53 days of age, ranging in weight from 65 to 101 gm. at the beginning of the experiments. The daily dose of l-thyroxine (Squibbs) was 0.1 mg. and the number of days on thyroxine varied from 10 to 16 days.

The technique employed was that described in a recent communication.¹ As a source of the B vitamins, we used in 4 series of experiments, 500 mg. Northwestern yeast; in three, 40γ to 60γ crystalline vitamin B₁ (Betaxin); and in two, 100γ vitamin B₁ plus 40γ riboflavin. We found that crystalline vitamin B₁ may approximate the protective action of dried Northwestern yeast in hyperthyroidism, from the standpoint of permitting increases in weight in presence of toxic doses of thyroxine, provided enough riboflavin is furnished daily as a supplement to our Ration 2345.¹

When it appeared that the animals receiving thyroxine without vitamin B₁ were near collapse, the entire groups were sacrificed, and vitamin C determinations were made of the adrenals, thymus, thyroids, pituitary, pancreas, liver, kidney, and cerebrum in 3 groups, and heart in 5. For the endocrines we used the micro technique of Farmer and Abt² which they perfected for the blood. Marked and one hundred percent consistent reductions in ascorbic acid content were found in the adrenals, thymus, liver, and kidney. That these marked reductions in ascorbic acid content are not due to heavy losses of body weight became apparent from vitamin B₆ studies, since in the latter experiments we encountered similar losses in weight with no demonstrable change in ascorbic acid in any of

† The terms ascorbic acid and vitamin C are used synonymously in this paper.

² Farmer, C. J., and Abt, A. F., *PROC. SOC. EXP. BIOL. AND MED.*, 1936, **34**, 146.

the tissues or endocrines. The reduction in vitamin C in the cerebrum was too small to be significant. There were no changes in the heart, and the results on the thyroid and pituitary are too irregular to warrant any conclusions at this time. In the adrenals there was a reduction of 42 to 44% ; in the thymus, 54 to 58% reduction; in the liver 30 to 50% reduction; and in the kidney 47 to 52% reduction in ascorbic acid. These calculations were made from results obtained on fresh tissue.

When there was gain in body weight in presence of thyroxine because of the additions of the B vitamins, there was only 10% reduction in vitamin C content of the adrenals. In the case of the thymus, liver, and kidney, however, the protective action of the B vitamins against vitamin C losses was only partial. Possibly the entire protection against vitamin C losses in the latter endocrine and tissues can be achieved only by vitamin C additions to the rat's diet. Such work is in progress.

It is of interest to note that Aszodi of Hungary has recently found changes in hemoglobin, red blood cells, and differential count in scurvy in guinea pigs to be identical with that of hyperthyroidism produced in the same animal.³ Harris and Ray⁴ reported extreme losses of ascorbic acid in the adrenals of scorbutic guinea pigs. Our similar findings indicate that in experimental hyperthyroidism produced by feeding toxic doses of thyroxine we have produced a vitamin C disturbance in the rat encountered by other investigators in scurvy in the guinea pig. Detailed results will appear *in extenso* elsewhere.

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Protective Effects Against Lethal *Streptococcus hemolyticus* of Glutamine and Various Sulfonamide Compounds.

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A total of 72 rabbits were inoculated with 1.0 cc. of a suspension of *Streptococcus hemolyticus*, sufficiently virulent to produce lethal effects within one week or less. Animals weighing approximately

³ Aszodi, Z., *Klin. Wochenschrift*, 1937, **20**, 715.

⁴ Harris, L. J., and Ray, S. N., *Biochem. J.*, 1933, **27**, 303.