

duction is about 590 and 680 calories per square meter per 24 hours respectively. In this laboratory the oxygen consumption per hour per 100 g body weight for the guinea pig is approximately 40% less than that of the rat. TSH concentration in the pituitary and blood of the guinea pig is considerably less than that of the rat(9,14). The difference in the rate of decay of thyroidal radioiodine in the rat and guinea pig is therefore consistent with measurements of other parameters of thyroid-pituitary function in these species.

Summary and conclusions. 1. The rate of biological decay of thyroidal I^{131} was compared in rat and guinea pig by determining the reduction in radioactivity over the gland utilizing the *in vivo* detection technic. The biological half-life of radioiodine was estimated to be 3.5 and 26 days for the rat and guinea pig respectively. 2. The results are considered to suggest that thyroid hormone secretion in the guinea pig normally proceeds at a much slower rate than in the rat. Consideration of other parameters of pituitary-thyroid function for both species supports this view.

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Effect of Corticotropin and Cortisone on Globule Leucocytes of Rat.* (20975)

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Globule leucocytes are found frequently in the mucous membranes of the alimentary and lower respiratory passageways of various animals, including the rat. These cells are distinguished by the presence in their cytoplasm of acidophilic metachromatic granules (Fig. 1). Globule leucocytes appear to be normal cells and seldom, except under abnormal conditions, show evidence of degeneration. In this respect they differ from plasma cells which are undergoing transformation to Rus-

sell body cells. Globule leucocytes arise by direct transformation of other cells, many origins having been suggested, including eosinophilic leucocytes, wandering cells, plasma cells, mast cells, and lymphocytes. It is only between the small lymphocyte and the globule leucocyte, however, that a complete series of intermediate stages has been described(1).

The functional significance of globule leucocytes is unknown, although their occurrence in the urinary tract of the rat has been correlated with the presence of a nematode infestation(2). Since adrenocortical hormones

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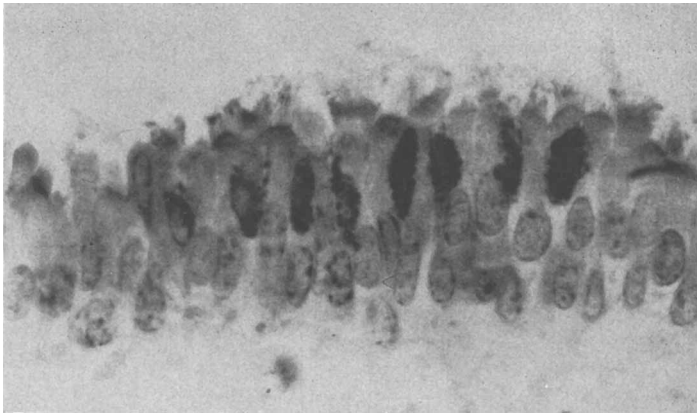


FIG. 1. Several globule leucocytes with their darkly stained granules are present in the tracheal epithelium.

cause a striking reduction in the mass of lymphoid tissue(3,4), in the number of circulating lymphocytes(5,6), and eosinophiles (6,7), information concerning the response of the globule leucocytes to these hormones might throw additional light on the origin and functional significance of these cells.

Procedure. Mature Sprague-Dawley rats of both sexes were used. Food intake was controlled by feeding with a stomach tube or by pair-feeding. Corticotropin was administered by continuous subcutaneous injection, and cortisone acetate[†] by daily injections (Table I). Control animals received physiological saline or Merck Vehicle No. 1 which

were used as injection media for the hormones. The adrenalectomized rats were maintained on 1% NaCl solution as drinking fluid and were sacrificed on the 21st post-operative day. Sections of trachea were stained by the Masson trichrome technic or with phosphotungstic acid hematoxylin and basic fuchsin. The number of globule leucocytes in the lining epithelium was counted in 5 well-spaced sections and averaged for each animal.

Results. The administration of corticotropin or cortisone acetate caused a sharp reduction in the number of globule leucocytes present in the tracheal mucosa (Table I). At the higher dose levels, these cells were eliminated almost completely from the mucous membrane. Adrenalectomy, on the other hand, exerted no consistent effect on the number of globule leucocytes in the trachea or colon in the 36 animals studied. With respect to the types of cells from which globule leucocytes are believed to arise, only the eosinophilic leucocyte and the lymphocyte exhibit such great sensitivity to corticotropin and cortisone. This sensitivity of the globule leucocyte to the action of adrenocortical hormones tends to support the anatomical evidence(1) previously cited which indicates that the globule leucocyte arises by transformation of lymphocytes. The elimination of globule leucocytes from the body by hormonal treatment provides a valuable tool for use in experiments designed to analyze the factors which are responsible for the appear-

TABLE I. Effect of Corticotropin and Cortisone on Globule Leucocytes in the Trachea.

Treat- ment*	No. rats	Daily dose (mg)	Days of treat- ment	Mean No. glob. leuc./section
C	8	1	21	53 ± 25
S	9	—	21	228 ± 84
C	6	6	21	.2 ± .2
S	5	—	21	111 ± 35
CA	5	5	21	8 ± 2
V 1	5	—	21	242 ± 42
CA	3	10	9	.5 ± .3
V 1	2	—	9	168 ± 30
CA	1	10	14	.4 ± .4
V 1	1	—	14	193 ± 18

* C = corticotropin; S = saline; CA = cortisone acetate; V = vehicle.

[†] We wish to thank Dr. Elmer Alpert of Merck and Co., Inc., for the cortisone acetate and Vehicle No. 1.

ance of these cells. Also, the question must be raised of the possible participation of these cells in defense against respiratory infection since the creation of a state of hyperadrenocorticalism in rats increases the frequency of respiratory disease.

Summary. Treatment for 21 days with one mg of corticotropin or 5 mg of cortisone acetate daily caused a marked decline in the population of globule leucocytes in the tracheal mucosa of rats. Administration of 6 mg corticotropin or 10 mg cortisone acetate daily caused these cells to disappear almost completely. In this response, the globule

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Effect of Epinephrine on Thyroid Hormone Level in Blood. (20976)

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Thyroid functional activity, employing radioiodide (I^{131}), has been related to the concentration of organic-bound I^{131} in blood. The level of organic-bound iodine in blood is generally regarded as an accurate index of the circulating thyroid hormone.* The concentration of organic iodine in blood represents the difference between the amount of hormone secreted by the thyroid and the amount of hormone metabolized or excreted during the same interval of time. Williams, Jaffe and Kemp(2) found that epinephrine administration to rats produced a lowering of I^{131} concentration in the thyroid and in the organic-bound I^{131} in the blood. Soffer and his associates(3) observed that the parenteral injection of epinephrine into both the intact and the totally thyroidectomized dog resulted in an increase in secretion of thyrotropin (TSH) from the anterior pituitary. Botkin and Jensen(4) reported that while both TSH and epinephrine administration to rats produced a lowering of the I^{131} concentration in the thyroid gland, the organic-bound I^{131} in the

blood was increased after TSH injection but decreased after epinephrine administration. This latter response was interpreted as being due to an increased utilization of circulating thyroid hormone caused by the epinephrine.

In order to study further the influence of epinephrine on blood organic iodine the effect of simultaneous administration of TSH and epinephrine or of thyroxin and epinephrine on the level of organic I^{131} in blood was investigated.

Methods and materials. Male rats of the Sprague-Dawley strain, weighing from 200 to 250 g, were used in all experiments. The animals were housed at $25^{\circ}\text{C} \pm 1^{\circ}$ and were fed Purina checkered dog chow. Food, but not water, was withheld for 18 to 20 hrs before sacrifice. Eighteen hrs before sacrifice the animals receiving TSH[†] (dissolved in 0.9% saline) were injected with $5 \mu\text{C } I^{131}$,[‡] and those receiving thyroxin (dissolved in NaOH at

* Recently Gross and Pitt-Rivers(1) have presented evidence that the thyroid releases, in addition to thyroxin, another active principle which was shown to be 3:5:3'-triiodothyronine.

[†] TSH used was obtained from two sources: A Parke, Davis preparation containing 10 J. S. units/mg, and an Armour preparation containing 5 J. S. units/mg. The authors greatly appreciate the generosity of Parke, Davis and Co., Detroit, Mich., and of Armour and Co., Chicago, Ill., in supplying these preparations.