the prophylactic effect of thiabendazole appears dependent upon the presence of the drug at time of exposure.

The feeding of thiabendazole to swine also exerted a distinct therapeutic effect. The data in Exp. 2 demonstrate that many *Trichinella* larvae were killed in the muscles of the treated pigs. The number of larvae in the tissues of the pigs fed 0.3% thiabendazole was reduced by more than 80%, as compared to the surviving untreated control pigs. The recorded numbers of dead larvae are perhaps minimal, since their persistence in the host muscle, and their ability to withstand artificial digestion, are uncertain.

Larvae were present in the swine fed 0.15% thiabendazole beginning on the 5th day. Since a proportion of the adult *Trichinella* worms persists in the intestine of swine for several weeks, it is quite probable that in Pig Nos. 612 and 620 some larvae were shed after thiabendazole medication had been discontinued. Such larvae, however, would have had a period of only 2 weeks in which to develop, before necropsy, and therefore might not have survived the digestion procedure (4). Similarly, in Exp. 2, it is conceivable that the larvae recovered from the pigs treated from the 28th to 35th day had been deposited after treatment. In pigs 737 and 751, treated from the 14th to 21st day, the female worms in the intestine at the end of medication might have deposited larvae which would have had about 3 weeks' development before necropsy. The small size and lack of infectivity of larvae recovered from pigs 737 and 751 could thus be attributed either to the direct effect of thiabendazole on the larvae, or to the drug's effect on the reproductive processes of the adults.

Summary. Pigs fed a diet containing 0.1% thiabendazole and exposed to larvae of *T. spiralis* developed either no infection or an infection of negligible severity. A concentration of 0.01% thiabendazole in the diet did not prevent pigs from acquiring trichinosis, but no mortality occurred when the pigs were exposed to huge numbers of *Trichinella* larvae during the period of medication. A moderate experimental infection of trichinosis was not eradicated by feeding 0.15% thiabendazole for 7 days, beginning on 5th day of infection. Pigs fed 0.3% thiabendazole for 7 days, beginning 2 or 4 weeks after exposure to massive infections, suffered no mortality, while 4 of 6 untreated pigs died. The data further indicate that the majority of the *Trichinella* larvae in the muscles of the treated pigs were killed by the medication employed.

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Seasonal Variation in Thyroid Gland Activity in Deermice.* (27444)

B. E. ELEFTHERIOU† AND M. X. ZARROW

Department of Biological Sciences, Purdue University, Lafayette, Ind.

Changes in the morphology, activity and iodine content of the thyroid gland of many species of wild and domestic animals(1-7) have been reported with changes in the season. Heretofore, however, seasonal studies on the thyroid gland of closely related, inter-

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† Present address: Roscoe B. Jackson Memorial Laboratory, Bar Harbor, Maine.

fertile, wild species of animals have not been recorded. Closely related, inter-fertile, wild species of mammals are easily found in the genus *Peromyscus* some of whose members have been recently introduced to the laboratory.

The present study was undertaken to investigate the seasonal variability in the thyroid gland of 2 subspecies of deermice (*Peromyscus maniculatus bairdii* and *P. m. gracilis*). In recent years, these two particular subspecies have been extensively utilized in behavioral experiments(8,9) and in studies on the role of the thyroid gland during growth and maturation(10). Our specific aims were to compare the effect of season on the thyroid gland of the 2 subspecies and to indicate the need for close control on the thyroid when comparing behavioral experiments in these subspecies.

Materials and methods. Adult male *P. m. bairdii* and *P. m. gracilis* were studied during the months of March, July, October and December. The 12-hour uptake of I^{131} by the thyroid was measured after injection of 4 μc of I^{131} per 20 g of body weight. I^{131} was reinforced with NaI as a carrier to a concentration of 1 μc I^{131} per μg of NaI. The thyroid glands were also sectioned and percent colloid and cell height measured(11,12). The thyroxine secretion rate (TSR) was also estimated utilizing a separate group of male deermice.

Thyroxine secretion rates were measured according to the method of Grosvenor and Turner(13). Basically, the procedure involved was to inject radioactive iodine at the dose mentioned previously. Twenty-four hours were allowed for fixation of I^{131} by the thyroid and for urinary excretion of excess isotope. External thyroid counts were taken at this time and at 24-hour intervals thereafter by first anesthetizing each animal with ether, then placing the animals on a lead plate with the thyroid region over a scintillation probe. During each counting period. efforts were made to insure placement of animals in a position in which the thyroid was directly over the probe. Measurements of thyroidal radioactivity were made with a scintillation counter, connected to a pulse height analyzer which, in turn, was connected to a rate meter. Conventional corrections were made for radioactive decay and background. After the 24-hour count, all animals were injected with 0.5 μg of L-thyroxine per 100 g of body weight. At this time, propylthiouracil at the level of 0.01% was placed in the drinking water to avoid further radioactive iodine uptake by the thyroid gland. After the initial radioactive iodine count and injection of L-thyroxine, counts were made at 24-hour intervals followed by further injection of increasing doses of L-thyroxine (1.0, 1.5, 2.0, etc.). The dose of L-thyroxine which prevented further thyroidal loss of radioactivity (95-100% of previous count to be retained) was estimated as the thyroxine secretion rate of the animal.

Results and discussion. The data on thyroid cell height presents evidence for greater activity in *bairdii* than in *gracilis* (Fig. 1). From March, through July, to October, *bairdii* shows a continually decreasing cell height. In contrast, *gracilis* shows a slight decrease in cell height during July, but a significant increase during October followed by a slight decrease during December. Cell height in *bairdii* during December is significantly greater than in *gracilis* ($p = .01$). In general, thyroid cell height indicates greater activity in the thyroid gland of *bairdii* as compared with *gracilis* during March, July and December, but a significantly lesser degree of activity during October.

The percent colloid in the thyroid glands of the two subspecies indicates a significantly greater amount of colloid in the thyroid of *gracilis* at all times studied (Fig. 2). The thyroid of *gracilis* shows the least amount of colloid during March and the greatest amount of colloid during July. The thyroid gland of *bairdii* contains its highest level of the colloid during October and the least amount during December. Thus it would appear that both subspecies show greater thyroid gland activity during March and December. *Gracilis* shows least activity during July and *bairdii* during October.

Radioactive iodine uptake by the thyroid glands of the 2 subspecies is plotted in Fig. 3. In general, *bairdii* illustrates a signifi-

TABLE I. Thyroxine secretion rates during 4 seasons in 2 subspecies of *Peromyscus maniculatus*.

Month	*Bairdii* No. of animals	*Bairdii* TSR range*	*Bairdii* Mean*	*Gracilis* No. of animals	*Gracilis* TSR range*	*Gracilis* Mean*
March	12	1 –2.5	1.62	12	.5–1.5	.92
July	12	1 –2.0	1.45	12	.5–1.0	.75
Oct.	16	.5–1.5	.81	16	1.0–2.0	1.50
Dec.	8	.5–2.5	1.93	8	.5–1.5	1.12

* In μg L-thyrozine/100 g body weight.

cantly greater uptake than *gracilis* during March, July and December. However, *gracilis* shows a 46% greater uptake than *bairdii* during the month of October.

Thyroid secretion rates (Table I) indicate that *bairdii* has a significantly greater TSR than *gracilis* in March, July and December, and *gracilis* has a significantly greater TSR during October. *Bairdii* does not show any significant difference in thyroxine secretion rate between March and July. This is in direct contrast with results obtained in I^{131} and cell height measurements and percent colloid. In March the cell height of *bairdii* is about 20% greater than in the summer and I^{131} uptake is about 45% less than in the summer. *Gracilis* shows the greatest thyroxine secretion rate in October, yet during this month the I^{131} uptake is almost 50% less than in the month of December while cell height is significantly different during these 2 months. The discrepancy between thyroxine secretion rates on one hand and cell height, I^{131} uptake and percent colloid on the other hand could be attributed either to basic differences among these tests in procedure or to real differences which have not been discerned. The latter may be the case, since no previous experiment on thyroid gland activity has been reported in which all of the measurements in the present study were made. In general, it may be concluded that although there is a lack of agreement between all the parameters utilized, the thyroid gland of *bairdii* is more active throughout the year except for the October period than is the thyroid of *gracilis*. A seasonal difference exists in the 2 subspecies. *Bairdii* shows a peak in thyroid activity during December and March, and a low in July and October; whereas *gracilis* shows a peak in October and December and a low

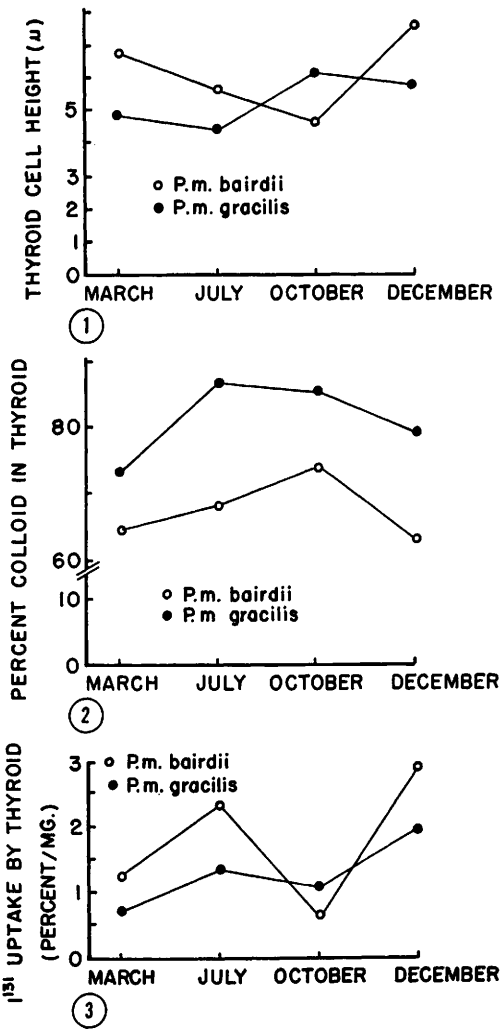

FIG. 1. Cell height of thyroid gland in 2 subspecies of *Peromyscus maniculatus* during 4 seasons of the year.

FIG. 2. Percent colloid in thyroid gland of 2 subspecies of *Peromyscus maniculatus* during 4 seasons of the year.

FIG. 3. Radioactive iodine uptake in 2 subspecies of *Peromyscus maniculatus* during 4 seasons of the year.

in March and July. However, agreement with all the parameters utilized was not obtained.

Summary. Thyroid gland activity as measured by percent colloid, cell height, I^{131} uptake and thyroxine secretion rates was studied in 2 subspecies of male deermice (*P. m. bairdii* and *P. m. gracilis*) during spring, summer, fall and winter. A seasonal difference in activity of the thyroid gland was noted in both subspecies. However, time of maximum and minimum activity also varies in the 2 subspecies. Thyroid cell height and TSR are at a maximum during December-March and a minimum in October for *bairdii*, and are at a maximum during October-December and a minimum during March-July for *gracilis*. Radioiodine uptake by the thyroid glands of both subspecies is high during July and December and low during March and October. With the exception of the October period, the thyroid gland of *bairdii* is more active throughout the year than the thyroid of *gracilis*. A lack of agreement with all parameters of thyroid activity utilized was noted.

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Blood Glucose Changes Induced by Cold, Epinephrine, and Norepinephrine in Dogs of Various Ages.* (27445)

ALVIN L. LARSON AND H. E. EDERSTROM
Department of Physiology and Pharmacology, University of North Dakota School of Medicine, Grand Forks

In experiments concerning the development of temperature regulation in newborn dogs it was observed that prior to 10 days of age the animals did not show much increase in metabolic rate on exposure to cold(1,2). This finding suggested that the newborn may have deficient chemical means of increasing the metabolic rate in response to cold. The incomplete state of development of the sympathetic-adrenal-hypothalamic system in the newborn may also explain the inadequate response to the cold environment(3). The experiments described below were done in an attempt to find if the glycemic response to cold, epinephrine, or norepinephrine varied with age in the dog, and might be related to the development of homeothermy.

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Methods. The animals used were healthy mongrel dogs of both sexes which were kept in air-conditioned kennels at approximately 22°C. In a typical procedure the adult animal was not fed for 12 hours prior to drawing blood for glucose determination. Nursing pups were kept with the female until just before blood sampling, and therefore were not in a fasting state. Blood glucose was determined on 0.1 ml samples of blood drawn from a leg vein, ear, or from a cardiac puncture sample, using the Nelson-Somogyi method(4). Immediately after the control sample, rectal temperature was taken with a thermocouple, and one of the following experimental conditions was imposed: (a) saline, 0.2 ml/kg; (b) epinephrine, 0.2 mg/kg; (c) norepinephrine, 0.2 mg/kg.

Following the intramuscular injections, ani-