(2.00 ± 0.44, $X \pm SEM$) than is that in mice kept in LPP (6.16 ± 0.47, $p < 0.001$). It has been previously well established that the activity of the pineal gland is dependent on lighting conditions and increases in animals subjected to longer dark-exposure[16]. On the basis of our present data the question of whether lighting conditions themselves affect the proliferation of thyroid fillicular cells or if the observed phenomenon reflects only the dark-induced pineal activation or light-induced pineal blockade, cannot be adequately answered. However, an assumption may be offered that thyroid mitotic incidence is under the inhibitory control exerted by the pineal gland, and this pineal effect can be blocked by the maintenance of animals in LPP. Such an interpretation of our present data is compatible with the previous report[14] demonstrating the increase of mitotic activity of thyroid follicular cells following PX in rats and with the series of reports showing thyroid hypertrophy after PX in rats[4,8,9]. mice[7], and cats[5]. Furthermore, the present results are in compliance with the earlier study[15] demonstrating attenuation of thiourea-induced thyroid enlargement in hamsters by maintaining the animals in SPP. Additionally, in the same report[15] the authors demonstrated that the inhibitory effect of longer dark-exposure on thyroid hypertrophy is independent on the presence of the pineal gland.

Inconsistently, in other studies constant darkness has been shown not to affect the thyroid weight[10] or even to cause thyroid enlargement[11,12].

Our hypothesis that the pineal gland decreases the proliferation of thyroid follicular cells, an effect which can be revealed by subjecting the mice to SPP, is supported by the experiments utilizing the pineal hormone, melatonin. Administration of melatonin has been reported to inhibit thyroid hypertrophy after methylthiouracil (MTU)-treatment[17] or after PX[6,7], but not to affect the thyroid weight in untreated controls with intact pineal[6,17,18]. Melatonin has been shown to decrease the height of the thyroid follicular cells not only in MTU-treated rats but also in untreated controls[17], which is in compliance with the PX-induced increase of the height in question[14]. Administration of pineal extracts induced signs of thyroid involution in rats[8,19]. In contrast, a goitrogenic effect of melatonin on the thyroid has been postulated[6,20]. Surprisingly, histological signs of thyroid hyperactivity after melatonin treatment have been observed in one laboratory[18]. It is noteworthy that melatonin exhibits antimitotic activity in some in vitro tests for antimitotic drugs[21,22], although it presumably does not compete with colchicine for tubulin binding sites[23].

In summary, the present results prove that, in mice with intact pineals, subjecting animals to SPP results in inhibition of mitotic activity of thyroid follicular cells when compared to animals reared in exposure to LPP. This effect is most probably related to the light restriction-induced activation of the pineal gland; however, direct effect of lighting conditions, independent on the presence of the pineal, cannot be excluded.

1 Acknowledgments. This work was supported by NSF grant PCM 8003441. Reprint requests should be addressed to A.L.
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0014-4754/84/111284-02$1.50 + 0.20/0

Effect of photoperiod and all-female grouping on the estrous cycle of the bandicoot rat, *Bandicota bengalensis*[1]

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Summary. Female bandicoot rats showing irregular cycles in 12L:12D were exposed to light-darkness cycles of 1L:23D, 4L:20D and 8L:16D. Significant regularization of the estrous cycle was observed in 8L:16D with most of the rats exhibiting a regular 3-day cycle and the regularity was further enhanced by all-female grouping (4/cage).
Key words. Bandicoat rat; *Bandicota bengalensis;* photoperiod; estrous cycle; all-female grouping.

Photoperiod is the primary environmental influence on reproduction of various vertebrate species[2-4] including rats[5-8] but not house mice[9]. While short photoperiod (8L:16D) inhibits reproductive tract growth in young female white-footed mice[10], 6L:18D fails to reduce reproductive success in adult female deer mice[11]. In golden hamsters, short photoperiod causes gonadal regression in adult[12], but does not affect the gonadal maturation of young ones[13].

All-female grouping causes pseudopregnancy (the Lee-Boot effect) or continuous diestrus in mice[14-16], but it has no effect on the estrous cycle in the Norway rat[17,18]. On the contrary, all-female grouping induces cyclicity in the non-cyclic female bandicoot rat[19], while individually housed bandicoot rats show extremely irregular estrous cycles with 12L:12D light-darkness cycle[20,21]. Thus, in the present study the effect of photoperiod and all-female grouping on the estrous cycle of the bandicoot rat was evaluated.

Materials and methods. Adult female bandicoot rats, *Bandicota bengalensis* (GRAY), weighing about 150–220 g each, were trapped in grain storage warehouses in Calcutta. They were

Effect of photoperiod and grouping on the estrous cycle of the bandicoot rat

Experimental schedule	Number of rats	Frequency of stages Proestrus-Estrus	Metestrus-Diestrus	Duration of cycles (days)	No. of rats in 3- or 4-day cycle 3-day	4-day	% of regularity
A) 12L:12D	20	40.28 ± 3.51	59.72 ± 3.51	5.60 ± 0.28	0/20	0/20	Nil
↓ 12L:12D	20	33.40 ± 2.85	66.60 ± 2.85	5.49 ± 0.32	0/20	0/20	Nil
B) 12L:12D	25	35.35 ± 3.20	64.65 ± 3.20	5.45 ± 0.20	0/25	0/25	Nil
↓ 1L:23D	25	30.30 ± 3.95	69.66 ± 3.99	5.27 ± 0.35	4/25	0/25	16
↓ 4L:20D	25	47.72 ± 2.34	52.28 ± 2.33	3.94 ± 0.20	4/24	0/25	16
		$p < 0.005$*, $p < 0.001$**		$p < 0.001$*, $p < 0.005$**			
C) 12L:12D	25	45.34 ± 4.84	54.66 ± 4.85	5.40 ± 0.35	0/25	0/25	Nil
↓ 4L:20D	25	48.17 ± 2.91	51.83 ± 2.90	3.85 ± 0.17 $p < 0.001$	2/25	4/25	24
D) 12L:12D	32	41.39 ± 3.63	58.61 ± 3.63	5.77 ± 0.26	0/32	0/32	Nil
↓ 8L:16D	32	55.23 ± 3.86	44.77 ± 3.85	3.73 ± 0.24	21/32	0/32	65.55
		$p < 0.025$*		$p < 0.001$*			
↓ 4/cage (in 8 separate cages)	32	59.97 ± 2.67	40.03 ± 2.65	3.21 ± 0.13	22/32	5/32	84.37
		$p < 0.001$*		$p < 0.001$*			

The results are expressed by mean ± SEM. *Comparison with 12L:12D. **Comparison with 1L:23D.

housed singly in cages (30.5 × 15 × 10 cm) in a uniform husbandry condition in the animal room (temp. 25 °C, light: 0600–1800/12 h dark). Rats were provided with food and water ad libitum. After acclimatization in the laboratory for 7 days, the estrous cycles of the rats were studied for 4 weeks by the vaginal smear technique[22]. Daily vaginal smears were taken once between 1000–1100 h and identified[20]. The frequency of a stage was determined as the percentage of appearance of that stage in vaginal smears taken over several weeks for a particular rat and the mean value was determined from all the rats of a group. Duration of estrous cycles was obtained from the interval between one stage and reappearance of the same stage. The animals were classified as regular cyclic if they had at least 3 consecutive cycles of the same length. If the length changed from one cycle to the next, the animal was classified as irregular. The rats that showed irregular cycles in 12L:12D were used in this investigation. Statistical analyses were done by Student's t-test. *Experiment I. photoperiod:* Rats (singly caged) were exposed to a given light schedule for 3 weeks without being disturbed and cyclicity was studied for 4 weeks in the same light schedule. Four groups of rats were used and they were exposed to different light schedules as follows: (a) group A – 12L:12D (lights on 0600–1800 h), (b) group B – 1L:23D (lights on 1000–1100 h), and rats of this group were finally transferred to 4L:20D (lights on 1000–1400 h), (c) group C – 4L:20D (lights on 1000–1400 h), and (d) group D – 8L:16D (lights on 1000–1800 h). *Experiment II. grouping:* Rats having exposure to 8L:16D were grouped 4 per cage (30.5 × 15 × 10 cm) without any alteration of light schedule. After grouping the animals were left undisturbed for 5 days and then the estrous cycles were studied for 4 weeks in the same light-darkness cycle.

Results and discussion. Results are shown in the table. With the exposure of different types of light schedules of 1L:23D, 4L:20D, 8L:16D and 12L:12D, it was observed that 8L:16D was the most effective in regulating the estrous cycle of this wild rat. In this light-darkness cycle, estrous cycle length was shortened, 65% of the rats showed regular 3-day cycle, and the frequency of 'proestrus-estrus' smears was also increased. The regular cyclic rats had estrous smears for 2 days out of a 3-day cycle. The present results indicate that the length of daily photoperiod influences the estrous cycle of the wild bandicoot rat in the laboratory. Thus, 8L:16D may have been more normal than 12L:12D. Furthermore, rats showed better regularity in the estrous cycle when they were in 4L:20D than in 12L:12D showing their affinity towards short photoperiod. Another interesting finding was that both in the 3-day and 5-day cyclic rats duration of estrous was 2 days as has been reported earlier[20]. In the wild, this long duration of estrous might provide a better opportunity for a female to receive males and consequently, it may be one of the factors to maintain a high rate of population growth in this species[23].

In contrast to mice[14–16], or the Norway rats[17,18], all-female grouping in bandicoot rats further enhanced the regularity of cycles in individuals maintained in 8L:16D and thus corroborates and confirms our previous report[19]. Irregular estrous cycles in the singly caged animals may be the effect of isolation stress[24,25]. In our earlier grouping experiment[19], the use of non-cyclic rats (showing continuous diestrus or metestrus) might render it difficult to judge properly the effect of further suppression of estrous cycle. In the present study, however, all-female grouping enhanced rather than suppressed cycles in the rats showing regular estrous cycles in 8L:16D and thus confirms the absence of the 'Lee-Boot' effect in this wild rat.

The present study together with the previous one[19] suggests that crowding and photoperiod are important external factors in the regularization of estrous cycle of the wild bandicoot rat in the laboratory.

1 The author is greatly indebted to Prof. A. Ghosh, Dept. Zool., Univ. Calcutta, for his guidance throughout the investigation. Financial assistance from U.G.C., New Delhi, is gratefully acknowledged. Reprint requests should be addressed to A. Sahu, Dept. OB-GYN, UTMB, Galveston, Tx 77550, USA.

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0014-4754/84/111285-03$1.50 + 0.20/0

Dietary induced increase of lactase activity in adult rats is independent of adrenals[1]

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Summary. Adult rats fed 10 days a low starch-high fat diet were either adrenalectomized or sham-operated and force-fed the same diet another 5 days; 14 h before sacrifice, some animals were force-fed a sucrose diet. Activity of lactase, sucrase and maltase was increased in adrenalectomized and sham-operated rats.
Keywords. Adrenalectomy; lactase; sucrase; diet; rats.

Lactase activity in adult rat jejunoileum depends on the intake of various carbohydrates including starch and sucrose[2–4]. Recently it has been shown that lactase activity is also influenced by thyroid hormones in adult rats[5–7]. However, possible effects of glucocorticoid hormones on lactase activity have not been investigated. The question arose whether the capability of lactase activity to react to dietary changes is influenced by the adrenal glands. This was explored in the present paper in adrenalectomized rats.

Materials and methods. Female rats of the Sprague-Dawley strain, bred in our own animal colony were weaned at 30 days of age and fed a standard laboratory chow (Lab Blox, Allied Mills, Chicago, IL) until 50 days of age. At that time they were fed a synthetic low starch (5 cal %), high fat (73 cal %) diet[4] for 14 days. After the rats were fed this diet for 10 days, they were either adrenalectomized or sham operated. After the operation, all animals had free access to 0.9% sodium chloride; and to ensure a regular food intake, they were force-fed the low starch diet (diluted to make 3 kcal/ml with water). Force feeding was performed 4 times a day, at 20.00, 1.00, 7.00 and 14.00 h. The amount of the diet was 6 ml, 6 ml, 3 ml and 3 ml, respectively, considering the circadian rhythmicity of the rats' food consumption and providing the daily caloric intake of 26 kcal per 100 g b.wt which corresponds to the ad libitum food intake of rats of this age[8].

Four days after the initiation of force feeding, rats were force-fed either an isocaloric sucrose diet (40 cal % of sucrose, 37 % of fat and 22 % of protein) or the low starch diet at 20.00 (6 ml), 1.00 (6 ml) and 6.00 (3 ml) h. To these diets, identical amounts of mineral and vitamin mixtures were added as pre-

Effect of feeding of sucrose diet on jejunal disaccharidases in sham-operated and adrenalectomized rats

	Low starch sham	Low starch adx	Sucrose sham	Sucrose adx
Number of animals	4	5	4	5
Body weight (g)				
on day −4*	200 ± 22	203 ± 14	203 ± 8	202 ± 3
on day 0	206 ± 19	222 ± 12	208 ± 9	220 ± 3
at sacrifice	208 ± 19	226 ± 11	212 ± 8	228 ± 3
Δ Body weight (g) (during the 5 days)	8.3 ± 2.9[a]	22.8 ± 3.3[b]	9.0 ± 0.7[a]	26.2 ± 1.4[b]
Serum corticosterone (μg/100 ml)	44.4 ± 13.6[a]	1.2 ± 0.3[b]	56.5 ± 3.5[a]	1.1 ± 0.3[b]
Jejunal protein (mg)	177 ± 6	175 ± 14	175 ± 14	170 ± 3
Lactase (μmol/mg prot/h)	0.30 ± 0.05[a]	0.22 ± 0.03[a]	0.63 ± 0.06[b]	0.58 ± 0.06[b]
Lactase (μmol/segment/h)	52 ± 9[a]	39 ± 6[a]	110 ± 12[b]	97 ± 9[b]
Sucrase (μmol/mg prot/h)	0.79 ± 0.10[a]	0.74 ± 0.08[a]	1.79 ± 0.17[b]	2.31 ± 0.13[c]
Maltase (μmol/mg prot/h)	5.77 ± 0.51[a]	4.31 ± 0.39[a]	9.32 ± 0.82[b]	9.85 ± 0.33[b]

* Adrenalectomy was performed on day −4; the feeding of sucrose diets was started on day 0 at 20.00. Rats were sacrificed 14 h later, i.e. 10.00.
[a–c] The values not sharing a common superscript are significantly different from each other by anova ($p < 0.05$).