interest to note that Deinhardt *et al.* (9) studied 93 marmosets (*Sanguinis fusciollis* and *Sanguinis nigricollis*) which died in the laboratory or were sacrificed for various experimental purposes, and described pyelonephritis in three and acute cystitis in one. In fact, pyelonephritis was the main cause of death in one instance. However, they did not culture the urine and/or kidneys of animals considered to have pyelonephritis and cystitis, making it difficult to evaluate their diagnosis of bacterial infection of the urinary tract.

Small foci of round cell infiltration were occasionally observed in the present study even in the kidneys of normal control animals. Deinhardt *et al.* (9) frequently found "chronic focal infiltrations" in the kidneys, and considered them to be associated with microfilarial infection.

It is of interest that the great majority of animals inoculated with *E. coli* or *P. mirabilis* showed significant bacteriuria several days after bladder inoculation. Pyelonephritis developed in 6 of the 20 animals, indicating that marmosets are susceptible to ascending urinary tract infection. This relatively high rate of retrograde infection suggests the existence of vesicoureteral reflux.

Summary. Experiments were undertaken in marmosets *(Callithrix jacchus)* to determine the tissue distribution of *E. coli* after intravenous inoculation and to investigate the susceptibility of the urinary tract of these animals to hematogenous or ascending infection. After intravenous inoculation of 10^7 *E. coli*, bacteria were rapidly cleared from the blood. High titers of bacteria were observed initially in liver and spleen but there was a rapid and progressive decline in number of organisms to complete sterility after 4 days. Pyelonephritis or bacteriuria did not result from hematogenous challenge. However, after inoculation of similar numbers of either *E. coli* or *P. mirabilis* into the lumen of the bladder, the majority of animals developed bacteriuria and 6 of 20 animals acquired pyelonephritis.

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Thyroiditis in Rats Injected Subcutaneously with 3-Methylcholanthrene (33357)

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Thyroiditis has been produced in the rat by immunization with homologous or heterologous thyroid extract or with thyroglobulin in Freund's adjuvant (1). The lesion has been described in rats with carbon tetrachloride-induced cirrhosis of the liver (2) and in rats ingesting 3-methylcholanthrene (MCA) in the diet (3). The purpose of the present paper is to describe thyroiditis in rats given a single s.c. injection of MCA.

TABLE I. Body and Thyroid Gland Weights and Subcutaneous Tumors.

Group	Sex	Thyroid gland	No. of animals	Av initial body wt. (g)	Av terminal body wt. (g)	Thyroid gland wt. (mg)		Subcutaneous tumors	
						Range	Av	Leiomyomas	Leiomyosarcomas
MCA	♀	Thyroiditis	10	190	244	45–127	81	4	3
		Normal	3		264	23–26	25	2	1
Control	♀	Normal	12	187	262	24–31	29	0	0
MCA	♂	Thyroiditis	3	285	391	51–62	56	1	2
		Normal	11		409	18–25	22	2	7
Control	♂	Normal	12	288	414	15–25	24	0	0

Methods. Buffalo strain inbred male and female rats 12 weeks of age maintained on Rockland laboratory pellets were used. Males weighed an average of 286 g, females an average of 189 g. Experimental animals were injected s.c. with 4 mg of MCA suspended in 0.2 ml of corn oil. Control animals were injected with 0.2 ml of corn oil. Complete autopsies were done after 22 weeks. The thyroid glands, as well as other organs, were weighed. Tissues were fixed in 10% formalin, sectioned, and stained with hematoxylin and eosin.

Results. The gross and microscopic findings at autopsy are given in the Table I. Thyroiditis was observed more often in female than in male rats. The gland, which was larger in females than in males, was firm and gray. The capsule of the gland was intact and not adherent to surrounding structures.

The thyroiditis was mild or moderate in degree, when compared with the severe thyroiditis observed previously (3). In 9 of 10 females the lesion was moderate and in 1 mild. Two males showed moderate thyroiditis, whereas in 1 it was mild.

With mild thyroiditis the thyroid gland was not enlarged. Lymphocytes and plasma cells were seen focally in the interstitium. In moderate thyroiditis the right or left gland each measured 2 × 4 × 7 mm. There were lymphocytes, plasma cells in various stages of maturation, and few macrophages containing hemosiderin diffusely throughout the interstitium. In some acini the epithelial cells were hyperplastic. The histological characteristics of the thyroiditis have been illustrated in previous publications (2, 3).

Some of the animals developed leiomyomas or leiomyosarcomas (see Table I). The thyroiditis did not appear to be related to the development of the leiomyomas tumors.

Discussion. The thyroiditis in the animals in this study was mild or moderate. In rats given MCA continuously in the diet the thyroiditis was severe (3). The glands with severe thyroiditis were much larger, measuring 4 × 8 × 12 mm. In addition to diffuse inflammation involving the interstitium, the cells of most of the acini were hyperplastic.

The MCA given to young Sprague-Dawley female rats by gastric intubation decreased the function of the thyroid gland (4, 5). Rats with subcutaneous sarcomas induced by MCA also had a decrease in thyroid function (6).

The thyroiditis in animals given MCA is similar to that described in rats after immunization with homologous or heterologous thyroid extract or with thyroglobulin (1). The lesion is seen in the rabbit, guinea pig, and dog immunized in a similar manner (7, 8). The thyroiditis in immunized animals is reversible. In rats given s.c. MCA, the thyroiditis was present after 22 weeks.

It is not known if the decrease in function of the thyroid gland is caused by a direct effect of MCA, changes in the metabolism of thyroid hormone by the liver or peripheral organs, or the disturbance of other endocrine

organs. MCA increases the amino acid incorporating activity in the liver of male rats (9) and stimulates the formation of thyroxine glucuronide by the microsomal fraction of hepatic cells in males and females (10). The chemical also releases prolactin from the pituitary gland of sexually mature females (11).

Thyroiditis in rats given s.c. or oral MCA was more frequent in females than in males. This finding is similar to that in human beings, since the lesion is seen more often in women than in men (12).

Summary. Buffalo strain rats were given a single s.c. injection of 4 mg of MCA in corn oil. Thyroiditis was observed in 10 of 13 females and 3 of 14 males. The glands were larger in the females. The thyroiditis could not be correlated with the presence of s.c. tumors.

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Proximal to Distal Secretory and Absorptive Gradients of the Rat Small Intestine* (33358)

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Absorption and secretion in the small intestine vary along its length (1). This systematic study of net movements of water, sodium, and chloride further defines the functional characteristics of mucosa in the various regions of the rat small intestine.

Materials and Methods. Male albino rats (200–400 g) were fasted with free access to water for 18 hr. They were anesthetized with intraperitoneal sodium pentobarbital (Nembutal) and the abdomen was opened. The common bile duct was ligated, and inlet and exit cannulas were introduced into the small intestine through small incisions and tied in place. Two or 3 gut segments were studied simultaneously by recirculation of 16 or 26 ml of solution from separate reservoirs through each segment for 3 hr. Blood was drawn from the vena cava at the beginning and at the end of some experiments. During the procedure the rats were warmed with heating lamps and the abdomen was kept moist with saline-soaked gauze. At the end of the experiment the entire small gut was stripped from the mesentery. The length and wet weight were measured immediately on all segments from pylorus to ileocecal value, whether perfused or not.

Transmural potential differences (PD) were measured during some studies with agar–saline bridges in contact with mucosal and serosal fluids. The mucosal bridge was placed intraluminally through the entry can-

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