excretion of bicarbonate decreased during osmotic (glucose) diuresis, even though, in 2 cases, the filtered bicarbonate was increased or unchanged, and although the increased excretion of water, sodium and chloride in all cases indicated the probable occurrence of proximal tubular diuresis(1-3). The results do not indicate whether proximal tubular diuresis may have decreased the proximal reabsorption of bicarbonate. If this occurred, however, it was superseded by other factors tending to increase the net tubular reabsorption of bicarbonate, since the urinary bicarbonate was diminished, while the filtered bicarbonate was increased or unchanged. One such factor may have been the slight (barely significant) increase in the serum pCO_2 which occurred in the two most definitive experiments (R. P. and R. K.). Recent workers have offered convincing evidence of a direct relationship between bicarbonate reabsorption and the serum pCO_2(6).

Summary. Under conditions favoring the excretion of bicarbonate, the rate of excretion of bicarbonate decreased, while the rates of excretion of other electrolytes increased, during an osmotic (glucose) diuresis. Possible explanations for this observation are discussed in relation to present concepts of osmotic diuresis and of the excretion of bicarbonate.

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Prevention of Innominate Bone Separation During Pregnancy in the Mouse.* (21000)

E. S. CRELIN. (Introduced by W. U. Gardner.)

From the Department of Anatomy, Yale University School of Medicine, New Haven, Conn.

Gardner and Van Heuverswyn(1) injected large amounts of testosterone propionate into pregnant mice and found that it inhibited pregnancy pelvic changes such as the formation of an interpubic ligament and increased flexibility of the sacroiliac joints. Since the interpubic ligament did not form, the separation of the innominate bones at the symphysis failed to occur. This prevented the marked increase in size of the birth canal which normally occurs during pregnancy. Two mice died with macerated fetuses in the cervix and upper vagina, 4 gave birth to macerated fetuses, and 4 gave birth to living young. These results indicate that in some mice one or more of the pregnancy pelvic changes are necessary for normal parturition to occur. In a previous experiment(2) the interpubic tissue in Brown-belt strain, virgin mice consisted chiefly of cartilage. During the first pregnancy this cartilage was replaced by an interpubic ligament. The latter produced a 4.3 mm average separation of the innominate bones at the symphysis. The present experiment was performed to determine the necessity of innominate bone separation at the symphysis during pregnancy.

Materials and methods. Twenty virgin mice of the Brown-belt strain were used. At puberty their innominate bones were tied together at the pubic symphysis in order to prevent their separation during pregnancy.

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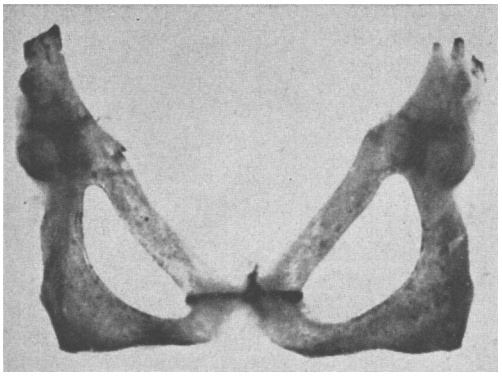

FIG. 1. A whole mount of the innominate bones and symphysis, excluding most of the ilia, from a female sacrificed immediately after her first parturition. Nine normal young were born on the 20th day. The black thread which bound the innominates together at the symphysis during pregnancy is still present. × 6.

This was done using a No. 4 half-circle eye needle and No. 000 black surgical silk thread. After exposing the symphysial area the needle was inserted through the medial portion of the obturator foramen on one side and then passed posterior to the symphysis and through the medial portion of the obturator foramen on the opposite side. The 2 free ends of the thread were then drawn tightly together and a double knot was made anterior to the symphysis. Following this, the incised skin over the symphysial area was closed by interrupted sutures. One week after the operation the females were mated. The time of fertilization was considered to be at midnight prior to the appearance of a vaginal mucous plug. Immediately following parturition the females were sacrificed. The symphysial tissue was studied grossly and histologically.

Results. Five mice failed to maintain their pregnancy beyond the early stages; 15 gave birth to normal living young. The duration of pregnancy in these latter animals was between 19 and 21 days: the usual length of time in the strain of mice used. The average number of newborn was 5: the range being 3 to 9. At autopsy the knotted thread was intact in each animal. Although the innominate bones at the symphysis were closely approximated, the symphysis was capable of some dorsal and ventral displacement (Fig. 1). The increased flexibility of the sacroiliac joints had occurred. Grossly the symphysial tissue appeared swollen. Histological examination of the symphysis revealed that the prepregnancy symphysial cartilage had been replaced by ligamentous tissue. The latter was edematous and the collagen fibers, instead of being in parallel bundles as they are in the normal symphysial ligament, were greatly disarranged.

Discussion. The results of the present experiment show that when innominate bone separation during pregnancy is prevented, the birth canal is still adequate for normal parturition as long as the pelvic joints, including the symphysis, are flexible. Since there is little strain difference in mice regarding pregnancy pelvic changes, it is probable that the present experiment could be duplicated using any strain.

The prevention of normal parturition in mice by injecting testosterone propionate during pregnancy(1) was probably due to the inhibition of the flexibility of the pelvic joints rather than the prevention of birth canal enlargement by inhibiting innominate bone separation.

The fact that the mouse symphysial tissue underwent the normal pregnancy changes on the histological level even though the lateral displacement of the innominate bones was prevented, is in accord with the findings of Van der Meer(3). When he injected relaxin into estrogen pre-treated, ovariectomized guinea pigs in which the lateral displacement of the innominate bones was prevented by the inhibition of pelvic muscle tension, the symphysial tissue became a short, swollen ligamentous mass.

Summary. The innominate bones in virgin mice of the Brown-belt strain were tied together at the pubic symphysis with silk thread. This was done to prevent innominate bone separation and concomitant enlargement of the birth canal during pregnancy. The females were then mated. Each pregnant mouse gave birth to normal living young at the usual time even though its birth canal was not enlarged during pregnancy by innominate bone separation at the symphysis. All of the pelvic joints became flexible, including the symphysis. Although the tied innominate bones remained closely approximated at the

symphysis the pre-pregnancy symphysial cartilage was replaced by ligamentous tissue.

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Sex Hormones as Protective Agents Against Radiation Mortality in Mice.* (21001)

E. A. MIRAND, J. G. HOFFMAN, M. C. REINHARD, AND H. L. GOLTZ.

From Roswell Park Memorial Institute, Buffalo, N. Y.

This report gives results of experiments on the protective effect of sex hormones against acute radiation mortality in dba mice. It has been known for some time(1,2) that in Swiss mice estrogens afford protection while androgens(2) do not. The dba mouse has been shown to be protected by the adrenal steroids, desoxycorticosterone acetate and cortisone(3). Moreover, this mouse strain showed a high sensitivity to head irradiation (3), which was perhaps attributable to injury of the pituitary(4). In view of the strain differences in radiation sensitivity seen in the course of these experiments, it was deemed desirable to examine the protective effect of sex hormones on dba mice. Since the hitherto reported protective action of estrogens was found only in preradiation-treated Swiss mice, the following experiments were carried out with postradiation as well as preradiation treatments.

Materials and procedures. a) *Mice.* Animals used in these experiments were all from our own inbred strain of dba mice. Males and females, 6 weeks old and weighing 20 g, were used. Purina Fox Chow and water were always available. b) *Hormones.* The two estrogenic hormones used were: diethylstilbestrol and α-estradiol benzoate. The two androgenic hormones were: testosterone propionate and depo-testosterone cyclopentylpropionate (the oil-soluble 17(beta)-cyclopentylpropionate ester of testosterone). c) *Radiation.* X-rays with a H.V.L. of 0.9 mm Cu had a dose rate of 150 r/min. at 30-cm target distance. The LD_{50} at approximately 12 days has been determined to be 500 r for whole-body radiation(1,2) of the dba mouse. This dose causes 100% mortality in about 20 days. The hormone was administered subcutaneously in 7 daily doses, with the 7th dose given immediately before radiation; in other animals it was given in 7 daily doses after irradiation, the 1st dose being given immediately after radiation. Table I gives the schedule of dose for each of the 4 hormones as well as the controls. For each hormone one control group had the radiation dose but no hormone while another control group was given hormone and no irradiation. The hormone dose was determined to be well below the limit of toxicity.

Results. Table I shows that the androgenic hormone provided no protection against the lethal effect of the 500-r x-ray dose. These hormones given before or after irradiation caused no change in the mortality rate. On the other hand, the estrogens reduced the mortality at 60 days after irradiation.

Fig. 1 shows that the mice without estrogen were all dead after 22 days. The effect of the stilbestrol treatment was to introduce a latent period before any animals died. This latent period was about 14-19 days for post-irradiation and 23-26 days for preirradiation administration of the diethylstilbestrol. The survival at 60 days is 35-40% for post- and 20-25% for pretreated mice.

The α-estradiol-benzoate-treated mice, Fig. 2, showed no latent period, except possibly

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