plate circuit. The plate circuit of the 6N7 is directly coupled to the grid of the relay tube by means of a simple NE51 glow tube.[2] When the section of the 6N7 twin triode connected to the grid circuit of the 6J5 is conducting, the large voltage drop across the 100K resistor in the plate load circuit makes a reduced voltage drop across the neon tube and its load resistor. During this phase, the neon bulb is unionized and, hence, has almost infinite resistance. The voltage across its load resistor, which is also the grid input resistor to the 6J5 is, therefore, 0. The 6J5 is at cutoff during this phase owing to the voltage across its 2.5K cathode resistor induced by the current flow through the 25K 10W resistor connected between B+ and the 6J5 cathode. The relay is de-energized because of reduced plate current passage.

When the triode section connected to the 6J5 grid is at cutoff, the reduced voltage drop across the plate load resistor in this section allows a large voltage drop to appear across the neon tube and its load resistor, thus ionizing the neon tube and allowing passage of current and causing a voltage drop across the resistor

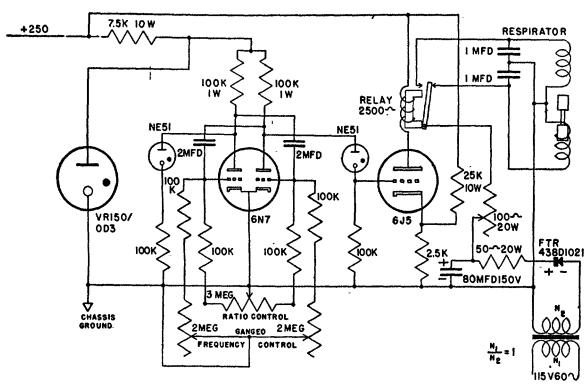

FIG. 3. Schematic circuit diagram of solenoid-driven artificial respirator.

in the grid circuit of the 6J5. The voltage drop across the neon load resistor/grid input resistor overcomes the cathode cutoff bias on the 6J5, causing it to pass plate current and energize the relay for the duration of the cutoff phase of the multivibrator. A second NE51 neon bulb is connected from plate to ground of the opposite section of the 6N7 to preserve the symmetry of the multivibrator and to provide operation indicators for the control. The two tubes are installed in standard pilot-lamp panel-mounting sockets on the unit.

The power supply for operation of the solenoids is provided with a unity ratio 30-w power transformer to isolate the system from powerline ground. Half-wave rectification is provided by a Federal Radio and Telegraph selenium rectifier 438D1021.

The electronic control system, as a separate unit, may serve other useful purposes in the laboratory. It has been used in our laboratory to operate an optical shutter in the application of photic stimulation.

The respirator has been used successfully with cats and dogs. It may be used with the usual laboratory compressed air source or compressed air or oxygen cylinder. The needle valves with which gas is ordinarily dispensed from these cylinders provide a convenient and reliable means of adjusting the rate of flow to the respirator. When the respirator is used on a 20-lb laboratory airline, a suitable regulating valve is required.

Manuscript received July 25, 1951.

[2] A suggested modification of the electronic control would eliminate the use of a relay, substituting two 6L6 tubes with the respirator solenoids in the plate circuits of these tubes, each tube being grid-controlled by the plate circuits of the 6N7 multivibrator.

Influence of Thyroid Status on Spermatogenesis

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Maqsood and Reineke (*1*) reported that the administration of thyroprotein (thyroactive iodinated casein) in physiological doses for short periods stimulated spermatogenesis in the testes of the young male mouse, kept at environmental temperatures of 24° and 30° C, whereas thiouracil treatment arrested the process of spermatogenesis, and the seminiferous tubules showed varying degrees of atrophic and degenerative changes. In view of these observations it was decided to study the effects of the administration of thyroxine and thiouracil for long periods on the process of spermatogenesis and the development of the interstitial cells of the testes in the rabbit and the ram, under natural environmental conditions. Libido and semen qualities of the control and treated animals were also estimated with a view to examining the possibilities of the practical application of thyroxine therapy in the field of reproduction.

Administration of L-thyroxine, in physiological doses, to 4 week-old-male rabbits for a period of 40 weeks stimulated the process of spermatogenesis and the development of the interstitial cells when compared with the control group (Fig. 1). A majority of the seminiferous tubules contained masses of maturing sperma attached to the Sertoli cells. A comparative increase in the number of rows of the spermatogenic cells was observed in a number of the seminiferous tubules, and the spermatogenic cells appeared in a stage of activity. The interstitial cells were numerous and well developed. The treated animals showed considerable increase in libido and improvement in semen qualities when compared with those of the control group. Feeding of thiouracil as 0.1% of the ration to 4-week-old male rabbits for a period of 40 weeks resulted in marked atrophic and degenerative changes in the seminiferous tubules of

[1] I am thankful to J. Hammond, F.R.S., and A. Walton for their help during the course of this work.

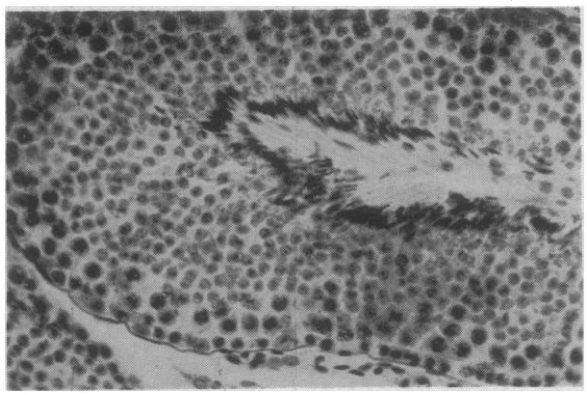

FIG. 1. Testis section of a young thyroxine-treated buck rabbit (exptl period, 40 weeks) showing active spermatogenesis and the tubules containing masses of maturing spermia. × 280.

the testes (Fig. 2). The tubules appeared greatly shrunken in diameter and contained a syncytium of Sertoli cells. Only a few degenerated spermatogenic cells were seen in some of the tubules. The spermatogenic cells in the majority of the tubules appeared to have been sloughed off. The lumina of some of the tubules showed an accumulation of fluid containing protoplasmic debris. The interstitial cells also showed atrophic and degenerative changes, with a marked decrease in the number of these cells. The thiouracil-treated rabbits neither showed any sexual desire nor produced any ejaculate during the experimental period.

Administration of thyroxine in optimal physiological doses to 4-week-old male rabbits for a period of about 16 weeks resulted in precocious sexual development as judged by the onset of libido, semen qualities, and testis histology. The seminiferous tubules contained numerous maturing sperma. The epididymal ducts also contained masses of sperm. The doses of thyroxine injected were adjusted according to the estimated thyroxine secretion rate in the male rabbit at different ages (*2*). On the other hand, thiouracil

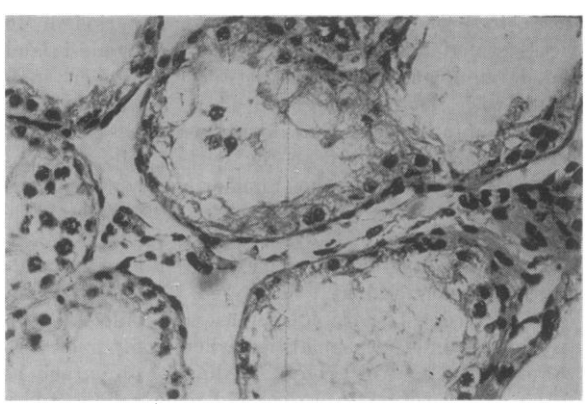

FIG. 2. Testis section of a young thiouracil-treated buck rabbit (exptl period, 40 weeks) showing marked atrophic and degenerative changes. The seminiferous tubules appear greatly shrunken in size and contain a syncytium of Sertoli cells. The interstitial cells also show marked degenerative changes. Compare with Fig. 1. × 280.

treatment arrested the onset of sexual maturity. The seminiferous tubules showed degenerative changes, with desquamation of the spermatogenic cells (Fig 3). The epididymal ducts contained numerous degenerated spermatogenic cells, and the epithelial cells lining the ducts showed a decrease in cell-height when compared with the control or thyroxine-treated rabbits. The interstitial tissue was poorly developed. These rabbits neither showed any sexual desire nor produced any ejaculate on collection in an artificial vagina.

Administration of thyroxine and thiouracil to young rams for a period of one year produced practically the same effects on the process of spermatogenesis and the development of the interstitial cells of the testes as those described above for the thyroxine- and thiouracil-treated rabbits, respectively. In the case of the thiouracil-fed rams, the degree of degenerative changes varied with the duration of the treatment period. A limited degree of spermatogenesis was ob-

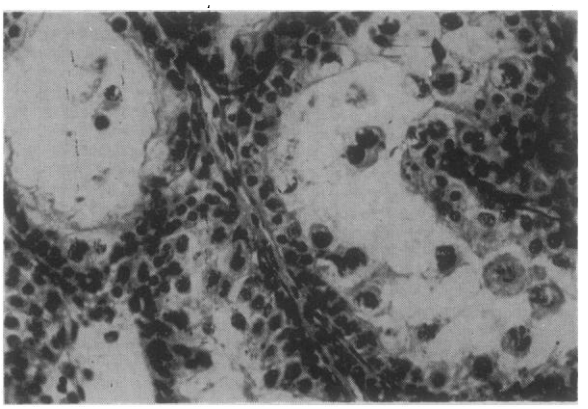

FIG. 3. Testis section of a 20-week-old thiouracil-treated male rabbit (exptl period, 16 weeks) showing arrested spermatogenesis. The spermatogenic cells show atrophic and degenerative changes, with some sloughed-off cells which are seen free in the lumina of the tubules. × 280.

served in the young ram during the nonbreeding season (*3*). It was interesting to find that the administration of thyroxine during the nonbreeding period stimulated the process of spermatogenesis in the young ram (*4*). Thyroxine therapy also stimulated the process of spermatogenesis in the testes of infertile rabbits which before the treatment showed arrested spermatogenesis (*5*).

The mechanism whereby the thyroid gland influences the process of spermatogenesis probably involves a complex series of interactions, some aspects of which have previously been discussed (*6, 7*).

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