

71-12,195

MILLER, Lorraine Kathryn, 1939-
THYMIC INFLUENCES ON THE GROWTH OF ACCESSORY
REPRODUCTIVE STRUCTURES IN MALE HOODED RATS.

The City University of New York, Ph.D., 1970
Physiology

University Microfilms, A XEROX Company , Ann Arbor, Michigan

THYMIC INFLUENCES ON THE GROWTH OF ACCESSORY REPRODUCTIVE
STRUCTURES IN MALE HOODED RATS

by

LORRAINE K. MILLER

A dissertation submitted to the Graduate
Faculty in Biology in partial fulfillment of the
requirements for the degree of Doctor of
Philosophy, The City University of New York.

1970

This manuscript has been read and accepted for the Executive Committee in Biology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

July 29, 1970
Date

Date

Constance R. Martin
Chairman of Examining Committee
Prof. C. Martin, Hunter College

Louis G. Moriber
Acting Executive Officer
Prof. Louis G. Moriber

Ezra Shahn
Prof. E. Shahn

Hunter College
Institution

B. B. Rubin
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William Etkin
Prof. W. Etkin

Albert Einstein College of Medicine
Institution

George H. Fried
Prof. G. Fried

Brooklyn College
Institution

Martin M. Schreiber
Prof. M. Schreiber

Brooklyn College
Institution

The City University of New York

ACKNOWLEDGEMENTS

The author wishes to express her deepest gratitude to Dr. Constance R. Martin for her invaluable guidance during the course of this study. Her wisdom in encouraging her students to select their own projects and to work a great deal on their own, coupled with her enthusiasm and knowledge render such projects 'labors of love' and lead her students toward an existence as independent investigators.

The author's thanks to Drs. Betty Rubin and Ezra Shahn for their many helpful suggestions during the preparation of this dissertation.

Special thanks to Dr. Theodore Shedlovsky for his encouragement and many kindnesses.

The author is indebted to the U.S. Department of Health, Education and Welfare and The City University of New York for financial support.

This thesis is dedicated to Jennie and the late Edward F. Seher, parents of the author. Their encouragement and love throughout the years made these studies possible.

Thanks also to my husband, David Miller, for his kindness and patience when the vicissitudes of graduate school rendered me less than pleasant to live with.

Many thanks to Dr. Betty Rosoff for her 'encouragement' and her friendship.

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ABSTRACT

THYMIC INFLUENCES ON THE GROWTH OF ACCESSORY REPRODUCTIVE
STRUCTURES IN MALE HOODED RATS

by

Lorraine K. Miller

Advisor: Dr. Constance R. Martin

Male hooded rats from a highly inbred colony were subjected to various surgical procedures at 30 - 33 days of age and autopsied 21 days later. Certain of the surgical groups were treated with hormones during the postoperative period. Accessory sex structures and other organs were weighed and chemical assays were performed upon ventral and dorsolateral prostate glands. The operations consisted of: thymectomy, sham thymectomy, no operation, thymectomy plus gonadectomy, sham thymectomy plus gonadectomy, gonadectomy, thymectomy plus adrenalectomy, sham thymectomy plus adrenalectomy and adrenalectomy. The chemical assays included: acid and alkaline phosphatase and citric acid determinations.

Animals thymectomized during the "summer" period (March through October) have heavier accessory sex structures and pituitary glands, higher total activities of acid and alkaline phosphatases and total citric acid content in the ventral prostate gland than either sham thymectomized or unoperated animals. Many of the findings in sham thym-

ectomized animals are similar to those in thymectomized animals but of lesser magnitude. Ventral prostate gland acid and alkaline phosphatase activities and accessory sex structure weights are lower during the "winter" (November through February) than during the "summer" period. The accessory sex structure response to removal of the thymus is not observed during the "winter" period.

Simultaneous gonadectomy at the time of thymectomy or sham thymectomy during the "summer" period and subsequent administration of testosterone eliminated the accessory sex structure responses to removal of the thymus as well as the increased pituitary gland weight observed in thymectomized animals. The dose of testosterone was sufficient to maintain enzyme activities per gram of ventral prostate gland comparable to those of intact animals, but was unable to maintain organ weight.

The general effect of adrenalectomy, alone or in conjunction with thymectomy and sham thymectomy, and subsequent cortisone acetate injection appeared to be stimulation of accessory sex structure growth suggestive of removal of hormones catabolic to these organs.

Saline injection obscures the accessory sex structure response to removal of the thymus but stimulates pituitary gland and accessory sex structure growth of unoperated animals; the most marked effect is on the seminal vesicles. Acid and alkaline phosphatase activities per gram of ventral prostate gland and per organ are also somewhat higher

in saline injected than in uninjected unoperated animals.

It is concluded that the endocrine system of the 30 - 33 day old rat is markedly susceptible to seasonal variation and that the observed effects of sham thymectomy and saline injection can be explained by assuming that secretion of various trophic hormones from the pituitary is promoted and that thymectomy involves the effects of sham thymectomy plus an additional release of gonadotrophin.

INTRODUCTION

Scientific literature of the late nineteenth and early twentieth centuries contains numerous suggestions that the thymus gland promotes prepubertal growth and retards sexual maturation. The large size of the thymus in the fetus and neonate and the relatively smaller size in the adult, led to the belief that the thymus is an endocrine organ which in some way influences development (Nelson, 1939).

More recent evidence supports a role of the thymus gland in the development of immunocompetence (Auerbach, 1967). However, there are suggestions that the thymus possesses other functions whose nature has yet to be elaborated. The present study concerns itself with a possible role of the thymus in the growth of accessory sex structures in male rats. The background of the study is contained in the remainder of the introduction.

Rowntree et al investigated the effects of thymectomy and of administration of calf thymus extract on the growth and development of successive generations of rats. They reported that removal of the thymus led to retarded development which could be prevented or reversed by the injection of calf thymus extract. Thymus extract accelerated development of intact animals and precocious development became more pronounced in each successive treated generation

(Cameron, 1936).

Numerous attempts to corroborate the findings of Rowntree et al met with failure (Allardyce et al, 1940; Burrill et al, 1941). Segaloff and Nelson (1941) employed the same experimental procedures utilized by Rowntree but were unable to reproduce his findings. The reasons for the lack of agreement among these investigators are not apparent from the literature.

There is a relative decrease in thymus size after the onset of puberty, but after prepubertal gonadectomy the involution of the thymus characteristically seen with age is delayed (Chiodi, 1940). These facts suggested a role for the thymus in the development of the reproductive system (Nelson, 1939). However, investigations in the first half of this century involving ablation of the thymus and attempted replacement failed to define a relationship between the thymus and the gonads (Andersen, 1932; Nelson, 1939).

Interest in our laboratory in a possible role of the thymus in sexual maturation was aroused by an observation by Martin (1964a) that prepubertal rats responded differently to thymectomy than to sham thymectomy. Sham thymectomy was found to retard the growth of ventral prostate glands and seminal vesicles of hooded rats subjected to surgery at 6 - 6½ weeks of age and autopsied twenty-one days later. On the other hand, removal of the thymus prevented the retardation which consistently followed sham surgery. It was suggested

that the retardation was a "stress effect" related to an increased secretion of adrenocortical hormones, and that the response to stress may be modified by thymectomy. This concept received support from a study which showed that unilateral adrenalectomy abolished the retardation of growth in sham operated animals, presumably by preventing excessive glucocorticoid secretion. Conversely, administration of cortisone acetate to thymectomized, sham thymectomized and unoperated animals retarded growth of the accessory sex structures. The retardation was most pronounced in the sham operated animals, presumably because of the additive effects of the exogenous hormone and the elevated endogenous hormone. The study suggested that "the thymus gland affected not only the level of secretion of adrenocortical hormones, but also the peripheral response to these hormones"(1964b).

If the thymus is involved in modifying adrenocortical secretion in response to stress, one might expect to find a difference between thymectomized and sham thymectomized animals in plasma glucocorticoid levels. To investigate this possibility, Sininsky measured plasma corticosterone levels in thymectomized, sham thymectomized and unoperated animals. Plasma corticosterone levels were elevated in all operated groups, and the elevation persisted for at least twenty-one days. However, no differences between thymectomized and sham thymectomized animals in circulating glucocorticoid levels were found (Sininsky and Martin, 1967). These findings would be difficult to reconcile with the con-

cept that the thymus modifies glucocorticoid secretion in response to stress. They do not, however, rule out the possibility that the thymus alters the peripheral response to glucocorticoids.

There is a considerable body of evidence suggesting that the adrenal cortex is capable of secreting sex steroids. In man, defects in adrenal hormone biogenesis are often associated with virilization and with increased levels of androgen and androgen metabolites in blood and urine (Bongiovanni et al, 1967). Androgens have been chemically isolated from human and bovine adrenal cortex and have also been detected in the venous effluent from these organs (Dorfman et al, 1956). There is also some evidence of a rather conflicting nature that the rat adrenal may secrete androgenic compounds. Howard reported that gonadectomy of adult rats resulted in rapid regression of the secretory epithelium of the accessory sex structures. However, gonadectomy of sexually immature rats was followed by uninterrupted development of structures believed to be under androgenic control. Eventually regression of these structures did occur. It was suggested that, for a time at least, an extratesticular source of "andromimetic" hormone existed. Since changes were observed in the adrenal cortex, the "andromimetic" function was ascribed to the adrenal (Howard, 1937 -38; 1939).

Nelson reported that administration of ACTH to gonadectomized immature rats stimulated growth of accessory sex

structures. Since stimulation was not evident in gonadectomized - adrenalectomized rats, it was suggested that ACTH can stimulate secretion of sex hormones by the rat adrenal (Nelson, 1941). However, VanderLaan (1960) using prostate weight as an indicator found no evidence that ACTH administration led to increased androgen secretion.

Katsh et al (1948) implanted adrenal cortices in the seminal vesicles of gonadectomized adult rats and found stimulated growth of the secretory epithelium similar to that produced by androgen. Attempts by Moore (1953) to repeat this experiment were unsuccessful. Moore (1953) raised the question as to whether the adrenal cortex normally secretes sex steroids, or whether this occurs only in unphysiological states. In 1967, Bardin and Peterson detected androgen in the adrenal venous effluent of rats. Androgen levels in the adrenal vein were higher in castrated than in intact animals. However, androgen was not detectable in the systemic circulation of castrated animals. Thus, there is some evidence that the adrenal cortex of the rat may secrete androgens under certain conditions, and the secretion of these androgens may be stimulated by ACTH.

Most of the androgens attributed to the adrenal cortex are weak androgens, that is, they provide less stimulation to the accessory sex structures than a potent androgen such as testosterone (Bardin et al, 1967; Dorfman et al, 1956). It is known that weak androgens can suppress the release of pituitary gonadotrophins, and that low doses of androgen

administered to animals with intact testes can decrease testis size through inhibition of gonadotrophin release (Dorfman et al, 1956; Hertz and Meyer, 1937).

It seemed possible that the retardation of accessory sex structure growth observed by Martin (1964a) in sham thymectomized animals might be related to stimulation of adrenal androgen secretion. In the presence of intact testes, weak adrenal androgen effects on gonadotrophin inhibition may mask the direct effects upon sex structures. It seemed of interest to study the effects of thymectomy and of sham thymectomy on the growth of accessory sex structures in young animals in which testicular androgen is expected to be low and in castrated animals lacking testicular androgen. In such animals the direct effects of adrenal androgen on sex structure growth might be more apparent. The effects of adrenalectomy on the accessory sex structure responses to thymectomy and sham thymectomy were also studied. If sham thymectomy leads to increased adrenal androgen secretion, one might expect to see an increased accessory sex structure growth in these young animals which would persist in gonadectomized but not in adrenalectomized animals. If the presence of the thymus is necessary for the stimulation of adrenal androgen secretion expected in sham thymectomized animals then one would expect to eliminate the stimulated growth of accessory sex structures by thymectomy. Thus, sexually immature sham thymectomized animals might be expected to have heavier accessory sex structures than thym-

ectomized or unoperated animals due to increased adrenal androgen secretion.

Two nonspecific phosphomonoesterases, one with an acid pH optimum (E.C.3.1.3.2.) and one with an alkaline pH optimum (E.C.3.1.3.1.), have been found in the rat prostate gland (Gutman, 1968). The functions of these enzymes in the prostate gland are as yet unknown, but their activities appear to be influenced by androgen. Schaffenburg and McCullagh (1950) reported an increase in the content of prostatic acid and alkaline phosphatases in immature rats which was proportional to the androgenicity of the administered steroids. They were also able to produce alterations in levels of the enzymes in intact immature rats by injection of Human Chorionic Gonadotrophin which is believed to stimulate androgen secretion by the testes. Castration of adult rats has been reported to decrease prostatic acid and alkaline phosphatases per unit weight of tissue. Administration of testosterone to gonadectomized animals restored the enzyme levels to precastrate values (Stafford et al, 1949).

Geller et al (1969) reported a decrease in prostatic acid phosphatase per gram of wet weight when the anti-androgen cyproterone acetate was administered to adult rats. The effect was attributed to possible interference with androgen binding and utilization in the prostate. The responses of prostatic acid and alkaline phosphatases to changes in androgen levels suggested their usefulness in the proposed study as a corollary to organ weight measurements. If sham

thymectomy stimulated prostatic growth via increased adrenal androgen secretion then one would expect the increased weight to be accompanied by an increase in the activities of acid and alkaline phosphatase in these structures.

Citric acid is another substance found in large quantities in semen and in the rat ventral prostate gland (Mann, 1964). Humphrey and Mann (1949) demonstrated that the level of citric acid in male reproductive organs and semen is related to the degree of sexual maturity of the animal, which is in turn linked with the activity of male sex hormones. Gonadectomy results in almost complete disappearance of citric acid from semen and reproductive organs. Administration of androgen to gonadectomized animals restores citric acid levels to normal. Furthermore, Mann and Parsons (1950) showed that secretion of citric acid by accessory sex structures in response to androgen can be used as a quantitative assay of androgen activity. Therefore, measurements of citric acid in the ventral prostate gland were also included in this study.

MATERIALS AND METHODS

Animals and surgical procedures

Male hooded rats from a highly inbred colony were subjected to surgery under ether anesthesia at 30 - 33 days of age and autopsied 21 days later.

The procedures for adrenalectomy and gonadectomy are essentially those described by Ingle et al (1949).

Thymectomy was performed as follows (Ingle et al, 1949, pp. 443 - 444): the animal was placed on his back with his head toward the operator. A midline incision was made through the skin and underlying superficial fascia from the level of the angle of the mandible to the level of the sixth rib. The deep fascia, salivary glands and musculature were separated with forceps to expose the trachea down to the manubrium sterni. A midline incision was made with scissors through the sternum to the level of the third rib. The thymus could be seen through the incision. Fine forceps were used to grasp the thymus while it was gently freed from the surrounding structures with cotton tipped toothpicks.

Too much traction on the thymus or careless freeing from underlying tissues may lead to rupture of the great blood vessels running beneath the thymus and subsequent loss of the animal. Generally, there was little or no bleeding.

Bleeding other than rupture of the great vessels was controlled with cotton packing.

After removal of the thymus the sternum was closed by a suture through the pectoralis muscle. The skin was then sutured.

Sham thymectomy was essentially the same as thymectomy except that the gland was merely freed of some of its connective tissue and returned to the thoracic cavity (Martin, 1964a).

Whenever thymectomy or sham thymectomy was performed in conjunction with another surgical procedure, thymectomy or sham thymectomy was effected before the other surgical procedure. Animals survived exposure of the thoracic cavity to atmospheric pressure better when under ether anesthesia for a brief period; gonadectomy or adrenalectomy could then be performed at a more leisurely pace.

Postoperative care

Animals were housed in a constant temperature room and given free access to Purina Rat Chow and water. Six to nine animals were housed together in large stainless steel wire bottom cages. Animals were weighed two to three times per week. The following are the various surgical groups prepared and their additional postoperative treatment:

Groups 1 - 6: uninjected animals.--Uninjected animals were run concurrently throughout the year. During statistical analysis of the data it appeared that the response to surgery differed in what are designated as "summer" months (March through October) and what are designated as "winter" months (November through February). Therefore, the data were segregated according to whether surgery was performed during the "summer" or "winter" period.

Groups 1 - 3: "summer" uninjected animals:

- Group 1: thymectomized
- Group 2: sham thymectomized
- Group 3: unoperated

Groups 4 - 6: "winter" uninjected animals:

- Group 4: thymectomized
- Group 5: sham thymectomized
- Group 6: unoperated

Groups 7 - 9: saline injected animals - "summer".--Animals in groups 7 - 9 were subjected to surgery during the "summer" period. They received 6 - 10 injections of 0.9 per cent sodium chloride solution in a volume of 0.1 cc. during the course of the study. Saline injected animals served as controls for gonadectomized and adrenalectomized animals which also received injections.

- Group 7: thymectomized + saline injection
- Group 8: sham thymectomized + saline injection
- Group 9: unoperated + saline injection

Groups 10 - 12: testosterone injected gonadectomized animals - "summer".

---Animals in groups 10 - 12 were subjected to surgery during the "summer" period. Each animal received ten subcutaneous injections, each injection containing 100 ug. of testosterone in a volume of 0.1 cc. (Oreton, aqueous suspension of testosterone, Schering Corporation, Bloomfield, New Jersey). The total dose of testosterone administered during the course of the study was one milligram per rat.

Group 10: testosterone injected thymectomized - gonadectomized animals

Group 11: testosterone injected sham thymectomized-gonadectomized animals

Group 12: testosterone injected gonadectomized animals

Groups 13 - 15: cortisone acetate injected

adrenalectomized animals - "summer".

---Animals in groups 13 - 15 were subjected to surgery during the "summer" period.

After much trial and error, the following regimen was adopted for maintenance of adrenalectomized animals:

1. Animals were offered a free choice of two drinking fluids: 0.9 per cent sodium chloride and tap water as suggested by Zarrow et al (1964).
2. Animals received 0.1 cc. subcutaneous injections containing 100 ug. cortisone acetate (aqueous suspension, Vitamix Pharmaceuticals, Incorporated, Philadelphia, Pennsylvania) on days 3,6,9,12,15 and 18 after surgery. Cortisone acetate administered in such a manner was found to promote the

best rate of survival and a growth rate most like that of animals with intact adrenals.

In spite of these precautions, mortality was extremely high among adrenalectomized animals (See Table 1). Only 25 per cent of adrenalectomized animals without thymuses survived, compared with 35 - 40 per cent of adrenalectomized animals with intact thymuses. The animals appeared to recover from surgery and survived up to two weeks before dying.

- Group 13: cortisone acetate injected thymectomized-adrenalectomized animals
- Group 14: cortisone acetate injected sham thymectomized - adrenalectomized animals
- Group 15: cortisone acetate injected adrenalectomized animals

TABLE 1

SURVIVAL OF ANIMALS ADRENALECTOMIZED AT
30 - 33 DAYS OF AGE

Type of Surgery	Number of Animals Subjected to Surgery	Number of Animals Surviving for 21 Days After Surgery
Thymectomy - Adrenalectomy	136	34
Sham Thymectomy - Adrenalectomy	88	34
Adrenalectomy	77	27
<hr/>	<hr/>	<hr/>
Totals	311	95

NOTE: Animals represented in the table received a variety of treatments before the described regimen for adrenalectomized animals was adopted.

Autopsy procedure

Animals were sacrificed 21 days after surgery by exsanguination under ether anesthesia. Autopsies were performed immediately after sacrifice. Tissues were dissected free of connective tissue and fat and placed on a moistened piece of filter paper in a petri dish kept on ice. Organs were weighed to the nearest 0.1 mg. (for pituitary glands, nearest 0.01 mg.) on a Mettler Type H 16 Balance (See Appendix Tables 2A - 16A).

Organs for enzyme and citric acid analysis were removed from the animals first and weighed immediately; aliquots were placed in separate small snap top jars and stored in the deep freeze. Enzyme assays were performed within one to two months after autopsy.

Acid and alkaline phosphatase determinations

Aqueous extracts of homogenates of ventral and dorso-lateral prostate glands were prepared in accordance with the procedure described by Bialy and Pincus (1967).

Five-tenth of a milliliter aliquots of the extracts were employed in the determination of acid and alkaline phosphatase activities according to the methods described by Hawk et al (1954).

All determinations were performed in duplicate.

One unit of phosphatase activity corresponds to the liberation of one milligram of inorganic phosphate per milligram of tissue during a one hour incubation at 37° C. (See Appendix Tables 17A - 46A)

Citric acid determination

Five per cent trichloroacetic acid extracts of ventral prostate gland homogenates were subjected to analysis for citric acid according to a modified pentabromoacetone method described by Spencer and Lowenstein (1967). (See Appendix Tables 47A - 58A.)

Statistical methods

Analyses of variance of two-way classifications of data were performed according to the methods described by Snedecor and Cochran (1967). (See Appendix Tables 59 - 62A for results of ANOVA.)

The data in the present study are represented by a Model I or fixed effects type of analysis of variance, in which differences between group means are attributed to differences in the effects of the treatments applied to the various groups.

Certain basic assumptions must be met before analysis of variance can be applied to data (Sokal and Rohlf, 1969):

1. Individuals in the study must be randomly selected.

In the present study animals were chosen from a population of animals 30 - 33 days of age. In order to eliminate effects due to body weight differences, animals were sorted into groups with a range of body weights of 4 - 5 grams, eg. 80 - 84 grams, 85 - 89 grams, etc. Animals of the weight groups were then randomly assigned to the three different surgical treatments.

2. The error term which contributes to each variate is assumed to be a random normal variable. Inspection of the data suggests that this assumption is met.
3. The variances of the different sample groups to be compared must be identical. There are several surgical groups in the present study which appear to be rather more homogeneous than other groups, i.e. "winter" uninjected animals and adrenalectomized animals. These groups were compared with surgical groups having a larger error and, therefore, the analysis was prejudiced against finding significant differences between "winter" and "summer" and between adrenalectomized and saline injected intact animals. In all other cases, however, the criterion appears to be met.
4. Data should be normally distributed. Scattergrams were prepared of the data in the present study. Those in which the data appeared superficially to be distributed non-normally, either exhibiting a flat distribution or large range or appearing skewed, etc. were tested for normality using the Kolmogorov - Smirnov test of goodness-of-fit for small sample numbers (Sokal and Rohlf, 1969, pp. 572 - 575).

In this test the data are divided into classes and the frequency of values appearing in each class if

the data were normally distributed is calculated. Differences between observed and calculated frequency provide deviations from a normal distribution. The greatest deviation is used to calculate the test statistic, D_s , which is equal to the maximum deviation divided by the number of samples. Wherever the sample test statistic exceeded the value of the statistic at the 0.05 per cent level of probability, normality was rejected (See Appendix Table 1A for data tested and results). Only one instance of definite non-normality and one of possible non-normality was found:

- a. seminal vesicle weights of sham-thymectomized - gonadectomized animals receiving testosterone were found to be non-normally distributed, and
- b. seminal vesicle weights of gonadectomized animals receiving testosterone exhibited a distribution of questionable normality.

Attempts to determine the type of distribution represented by these data using approximate tests described by Snedecor and Cochran (1967, pp. 276-77) suggested that the data were not of the Poisson, lognormal or quasi-binomial types. Comparison of the data of these two groups with that of thymectomized - gonadectomized animals (Group 10) which were normally distributed showed

they were not very dissimilar. Therefore, these data are represented by a mean and standard error in the tables, although the meaning of these terms is questionable. Snedecor and Cochran (1967, p. 276) state that single classification analysis of variance is little affected by moderate non-normality. Therefore, when seminal vesicle weights of sham thymectomized - gonadectomized (Group 11) and of gonadectomized (Group 12) animals were compared with those of their counterparts with intact gonads, single classification analyses of variance (similar to t-tests) were employed. (See Appendix Tables 61A - 2 and 61A - 2a.)

5. The treatment effects in any variate should be additive. The presence of multiplicative effects was determined as an interaction term in the two-way analysis of variance.

Where differences between group means might result from differences in body weight, analysis of covariance was performed on groups in which a significant correlation was found between organ weight and body weight (Snedecor and Cochran, 1967, pp. 419 - 446). (See Appendix Tables 63-70A.)

Values of p of 0.05 per cent or less for differences between the means are reported as statistically significant.

TABLE 2

ABBREVIATIONS EMPLOYED

ACTH	Adrenocorticotrophic Hormone
Adr.	Adrenal gland
Adx	Adrenalectomy
C.G.	Coagulating glands
DLP.	Dorsolateral prostate gland
Final	Final body weight (at time of sacrifice)
FSH	Follicle Stimulating Hormone
Gx	Gonadectomy
Init.	Initial body weight (at time of surgery)
LH	Luteinizing Hormone
Pit.	Pituitary gland
S	Sham thymectomy
S+Adx	Sham thymectomy + adrenalectomy
S+Gx	Sham thymectomy + gonadectomy
S.V.	Seminal vesicles
T	Thymectomy
T+Adx	Thymectomy + adrenalectomy
T+Gx	Thymectomy + gonadectomy
U	Unoperated
V.P.	Ventral prostate gland

RESULTS

Organ and body weights

Uninjected "summer" animals (Groups 1 - 3).---During the "summer" months thymectomized animals show marked acceleration of accessory sex structure growth. Thymectomized "summer" animals (Group 1) have significantly heavier accessory sex structures (ventral and dorsolateral prostate and coagulating glands and seminal vesicles) than sham operated (Group 2) or unoperated animals (Group 3) run concurrently. (See Figure 1; Table 3.)

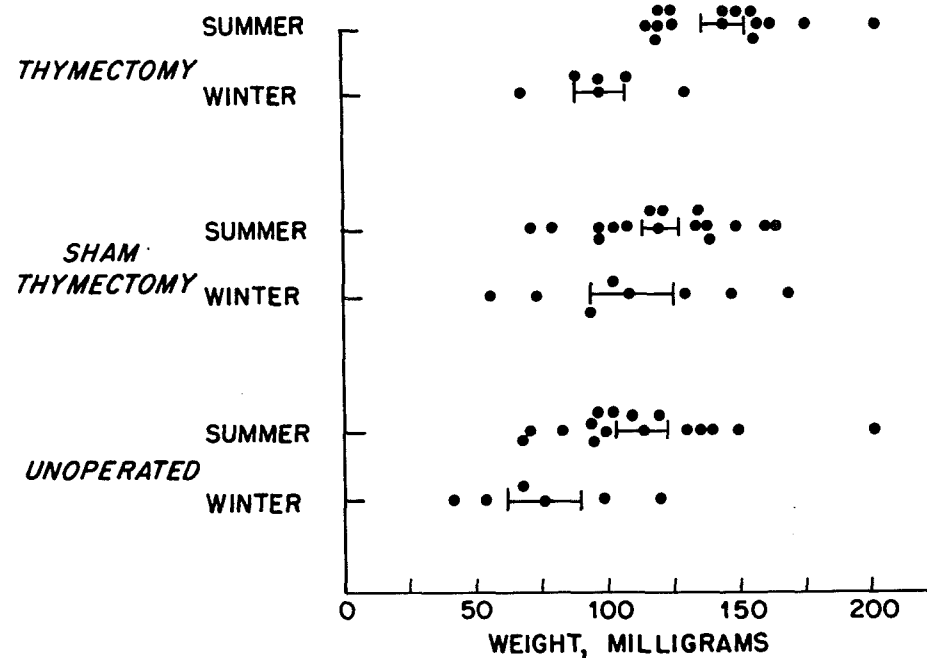
Thymectomized "summer" animals also have heavier kidneys and pituitary glands than sham thymectomized or unoperated "summer" animals, but the differences are not statistically significant (Table 3).

Sham thymectomy is followed by some acceleration of accessory sex structure growth. Sham thymectomized animals tend to have heavier ventral prostate glands and seminal vesicles than unoperated animals, as well as heavier testes and pituitary glands, but the differences are small compared with the standard error. (See Figure 1; Table 3)

The accelerated growth of accessory sex structures is not dependent upon nonspecific stimulation of body growth. None of the surgical procedures significantly affected body weight gains.

FIGURE 1

SEASONAL VARIATION IN ORGAN WEIGHT RESPONSES
OF THE VENTRAL PROSTATE GLAND
TO THYMECTOMY AND SHAM THYMECTOMY



19a

Significant differences: T - "summer" > (S - "summer" + U - "summer"), .001 < p < .01
 T - "summer" > T - "winter", .001 < p < .01
 U - "summer" > U - "winter", .01 < p < .05 (N.S. when corrected
 for body weight differences. See Appendix Tables 65 - 66A.)

TABLE 3

SUMMARY TABLE OF BODY AND ORGAN WEIGHTS
(Means and Standard Errors)

Organ Weights in Milligrams

Surgical State	Body Wt.(g) Init.-Final	V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.	
<u>Uninjected animals - "summer" (Groups 1 - 3)</u>											
T (Group 1)	71	168	146	91	153	40	1991	1625	33	-	7.2
S.E.	2.2	4.0	6.7	4.8	15.3	3.0	85.2	36.0	1.5	-	0.26
n	14	14	14	14	14	14	14	14	14	-	8
S(Group 2)	67	164	122	71	120	33	2040	1519	30	433	6.6
S.E.	2.6	4.6	7.2	4.1	10.0	2.4	54.0	49.1	1.2	35.2	0.76
n	15	15	15	15	15	14	15	15	15	15	8
U(Group 3)	65	159	113	72	103	31	1941	1505	31	407	6.1
S.E.	2.4	5.5	8.9	6.2	12.5	3.3	58.4	63.3	1.1	27.7	0.85
n	15	15	15	15	15	15	15	15	15	15	8
<u>Uninjected animals - "winter" (Groups 4 - 6)</u>											
T(Group 4)	60	139	99	60	118	27	1800	1349	29	-	5.8
S.E.	1.9	10.8	10.2	8.0	32.6	3.9	72.	158.	3.3	-	0.64
n	5	5	5	5	5	5	5	5	5	-	5
S(Group 5)	60	142	110	62	92	27	1769	1280	28	347	5.9
S.E.	2.0	7.8	15.8	7.2	20.3	3.8	54.8	91.2	1.4	43.3	0.36
n	7	7	7	7	7	7	7	7	7	7	7
U(Group 6)	58	129	76	48	62	21	1702	1129	30	317	5.3
S.E.	2.3	7.1	14.4	7.4	23.2	5.4	71.2	111.	2.8	86.3	0.46
n	5	5	5	5	5	5	5	5	5	5	5

TABLE 3 - 2

Organ Weights in Milligrams

Surgical State	Body Wt.(g) Init.-Final	V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.	
<u>Saline injected "summer" animals (Groups 7 - 9)</u>											
T(Group 7)	75	180	136	88	162	40	2016	1610	33	-	7.6
S.E.	3.3	10.1	13.2	8.1	22.3	5.5	92.1	115.	1.8	-	0.55
n	9	9	9	9	9	9	9	9	9	-	5
S(Group 8)	74	174	119	78	139	36	2060	1565	31	452	7.1
S.E.	3.2	5.5	11.2	6.6	18.5	4.8	121.	68.4	1.5	31.5	0.34
n	10	10	10	10	10	10	10	10	10	10	7
U(Group 9)	74	173	120	81	152	38	2036	1608	31	459	8.2
S.E.	2.7	6.6	12.8	6.0	21.1	4.7	78.2	62.5	1.8	27.7	0.35
n	11	11	11	11	11	11	11	11	11	11	6
<u>Testosterone injected "summer" gonadectomized animals (Groups 10-12)</u>											
T+Gx(Group 10)	71	165	85	67	91	27	-	1566	35	-	8.2
S.E.	2.4	5.6	9.3	4.6	11.	3.0	-	52.5	1.4	-	0.47
n	20	20	20	20	20	20	-	20	19	-	12
S+Gx(Group 11)	72	169	85	67	104	29	-	1576	34	500	8.7
S.E.	2.6	4.8	11.	5.5	18.0	3.8	-	52.6	1.3	36.9	0.42
n	21	21	21	21	21	21	-	21	21	21	14
Gx(Group 12)	68	171	83	63	84	26	-	1576	34	507	8.8
S.E.	2.1	4.4	10.	5.2	13.	3.0	-	50.6	1.6	30.9	0.33
n	23	23	23	23	23	23	-	23	23	23	16

TABLE 3 - 3

Organ Weights in Milligrams

Surgical State	Body Wt.(g) Init.-Final	V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
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Cortisone acetate injected "summer" adrenalectomized animals (Groups 13 - 15)

T+Adx(Group 13)	82	163	131	96	195	40	2110	1592	-	-	7.4
S.E.	2.8	8.0	10.9	7.6	23.5	3.4	60.2	116.	-	-	0.47
n	15	15	15	15	15	15	15	15	-	-	15
S+Adx(Group 14)	80	166	133	87	170	42	2053	1549	-	523	7.4
S.E.	3.1	10.5	8.5	8.5	21.7	4.7	112.	88.3	-	27.5	0.52
n	12	12	12	12	12	12	12	12	-	12	12
Adx(Group 15)	75	143	126	88	170	37	2029	1330	-	497	5.7
S.E.	2.0	6.5	8.6	4.7	15.0	2.8	64.9	53.2	-	24.3	0.54
n	12	12	12	12	12	12	12	12	-	12	11

Uninjected "winter" animals (Groups 4 - 6).-- During the "winter" period the effect of removal of the thymus on accessory sex structure growth is not readily apparent from the available data. There are no significant differences among thymectomized, sham thymectomized and unoperated animals in organ weights because of large variations in the thymectomized group (Table 3). However, animals thymectomized during the "winter" tend to have considerably heavier seminal vesicles and kidneys than do sham operated animals.

"Seasonal" variation.--A "seasonal" variation in the accessory sex structure response to thymectomy is suggested. Animals thymectomized during the "summer" period exhibit an increased growth of accessory sex structures, while those thymectomized during the "winter" period do not. (See Fig.1; Table 3.)

"Summer" thymectomized animals have significantly heavier ventral and dorsolateral prostate and coagulating glands than do "winter" thymectomized rats. Since "winter" animals tend to be smaller initially than "summer" animals and also gain less weight during the course of the study, analysis of covariance was performed to determine whether observed differences in accessory sex structure weight were due solely to differences in body weight. Mean ventral prostate gland weights adjusted for initial or final body weight of animals thymectomized during the "summer" period are significantly greater than those of animals thymectomized during

the "winter" period. (See Appendix Tables 63 and 64A for ANCOVA.) Therefore, the observed differences in ventral prostate gland weight after "summer" and "winter" thymectomies are not entirely a result of body weight differences.

Unoperated "summer" animals also have heavier accessory sex structures than their counterparts during the "winter" months. When ventral prostate gland weights of unoperated animals are adjusted for differences in initial and final body weight no significant differences are observed. (See Appendix Tables 65 and 66A for ANCOVA.) Apparent "seasonal" differences in organ weights in unoperated animals appear to be associated with the smaller body weights of the "winter" animals.

"Summer" animals in general tend to have heavier kidneys, testes, thymuses and pituitary glands than do "winter" animals. It is of interest that during the "winter" period when thymectomy fails to elicit greater accessory sex structure growth than does sham thymectomy, no differences between thymectomized and sham thymectomized animals in pituitary gland weight are observed (Table 3).

Saline injected "summer" animals (Groups 7 - 9).---Saline injections administered to unoperated animals appear to result in stimulation of accessory sex structure growth. When saline injected unoperated animals (Group 9) are compared with uninjected unoperated animals (Group 3) run concurrently accessory sex structures of injected animals appear to be heavier, the most marked difference being seen

in seminal vesicle weight (Figure 2). As a result of random selection injected animals have greater initial and final body weights than uninjected animals. Therefore, analysis of covariance was utilized to determine if the differences in seminal vesicle weight are due to body weight differences. The mean seminal vesicle weight for injected controls adjusted for initial or final body weight is 20 - 30 per cent greater than that for uninjected controls; the statistical significance of the difference is obscured by the wide range of values. (See Appendix Tables 67 and 68A for ANCOVA.)

Saline injected unoperated animals also have pituitary glands 16 - 18 per cent heavier when corrected for body weight differences than do their uninjected counterparts. (See Appendix Tables 69 and 70A for ANCOVA.)

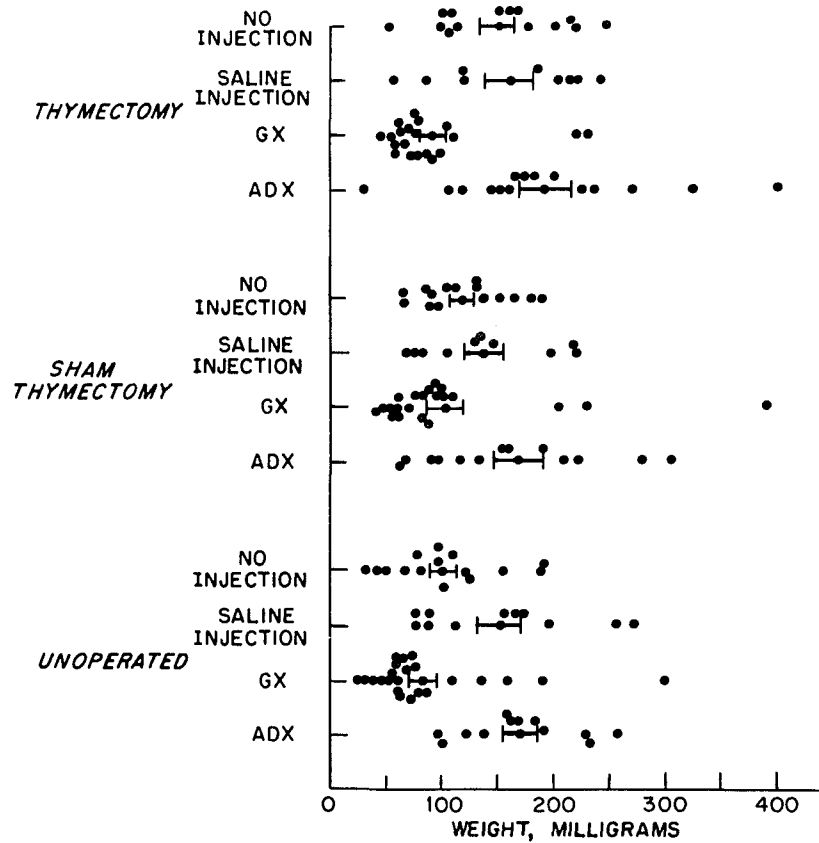
Saline injection appears to retard growth of ventral prostate glands in thymectomized animals. Ventral prostate gland weights of saline injected thymectomized animals (Group 7) are somewhat smaller than those of uninjected thymectomized animals (Group 1), in spite of the greater initial and final body weights of the injected animals (Table 3).

Saline injection has little effect in sham thymectomized animals.

Saline injection obscures the accessory sex structure response to removal of the thymus. No significant differences among thymectomized, sham thymectomized and unoperated animals receiving saline injections in organ weight or

FIGURE 2

EFFECT OF SURGICAL AND HORMONAL TREATMENT
ON SEMINAL VESICLE WEIGHTS



New significant differences:

Uninjected animals: $T > (S + U)$, $.01 < p < .05$

Gonadectomized animals $<$ Intact gonads + saline, $.001 < p < .01$
(Groups 10 - 12) (Groups 7 - 9)

$T + Gx$ (Grp. 10) $<$ $T + \text{saline}$ (Grp. 7), $.001 < p < .01$

Gx (Grp. 12) $<$ $U + \text{saline}$ (Grp. 9), $.01 < p < .05$

(Saline injected (Grps. 7 - 9) $>$ Uninjected (Grps. 1 - 3),
 $.10 > p > .05$

$U + \text{saline}$ (Grp. 9) $>$ $U - \text{uninjected}$ (Grp. 3), $.10 > p > .05$)

body weight gains is observed (Table 3).

Testosterone injected "summer" gonadectomized animals (Groups 10 - 12).-- The administered dose of testosterone is not sufficient to maintain growth of accessory sex structures in gonadectomized animals (Groups 10 - 12) at a level comparable to that of animals with intact gonads receiving saline injections (Groups 7 - 9; Figure 2 and Table 3). The effect of gonadectomy is most pronounced in thymectomized animals, i.e. differences between thymectomized - gonadectomized animals (Group 10) and their intact counterparts (Group 7) are greater than the differences between sham thymectomized - gonadectomized and gonadectomized animals and their intact counterparts. Thus, intact gonads appear to be essential for the accessory sex structure response to removal of the thymus. In contrast to the situation in animals with intact gonads, no significant differences among thymectomized - gonadectomized (Group 10), sham thymectomized - gonadectomized (Group 11) and gonadectomized animals (Group 12) receiving testosterone injections in organ weight or body weight gains are observed.

Once again where thymectomy fails to elicit accelerated growth of accessory sex structures, pituitary gland weights of thymectomized animals are no greater than those of sham operated animals.

Cortisone acetate injected "summer" adrenalectomized animals (Groups 13 - 15).-- The general effect of removal of the adrenals is to increase growth of accessory

sex structures. However, thymectomized animals show a different pattern of response to adrenalectomy than do animals with intact thymus glands.

Sham thymectomized - adrenalectomized (Group 14) and adrenalectomized animals (Group 15) have somewhat heavier accessory sex structures than do their counterparts with intact adrenals receiving saline injections (Groups 8,9). While the differences are small, they are impressive since intact animals have considerably higher body weight gains than adrenalectomized animals. (Figure 2; Table 3)

Thymectomized - adrenalectomized animals (Group 13) have somewhat heavier dorsolateral prostate glands and seminal vesicles than do thymectomized animals with intact adrenals (Group 7) in spite of smaller body weight gains. However, ventral prostate glands of thymectomized - adrenalectomized animals are somewhat lighter than those of thymectomized animals.

The response of the accessory sex structures to thymectomy is obscured by adrenalectomy. Dorsolateral prostate glands and seminal vesicles of thymectomized - adrenalectomized animals tend to be slightly heavier than those of sham thymectomized - adrenalectomized or adrenalectomized animals, but the differences are not statistically significant. No apparent differences among the three groups in ventral prostate gland weight are observed.

Thymectomized - adrenalectomized and sham thymectomized - adrenalectomized animals have heavier pituitary

glands than do adrenalectomized animals. Just as there are no differences between thymectomized - adrenalectomized and sham thymectomized - adrenalectomized animals in ventral prostate gland weight, there are no differences between the two groups in pituitary gland weight.

Summary.--Thymectomy during the "summer" months leads to accelerated accessory sex structure growth in the presence of intact gonads. Saline injection and adrenalectomy with subsequent cortisone acetate administration obscure the responses to removal of the thymus.

Ventral prostate gland: acid and alkaline phosphatases

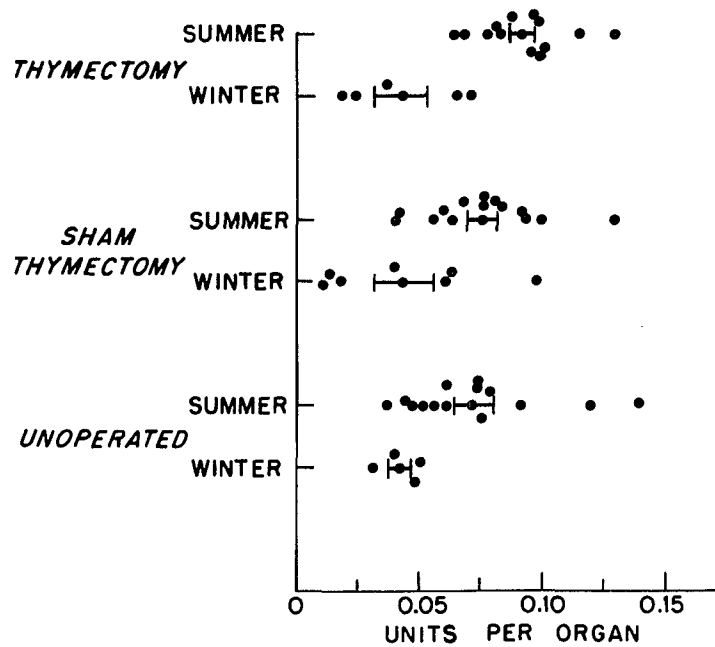
Uninjected "summer" and "winter" animals (Groups 1 - 6).--Animals thymectomized during the "summer" period (Group 1) have heavier ventral prostate glands and somewhat higher activities of acid and alkaline phosphatase per organ than do sham thymectomized (Group 2) or unoperated animals (Group 3). (See Figure 3; Table 4.) There is a suggestion that thymectomy and sham thymectomy decrease alkaline phosphatase activities per gram of ventral prostate gland (Table 4).

In the "winter" period all enzyme activities are lower than the corresponding values during the "summer" period. "Summer" - "winter" differences appear to be greater in sham operated animals and are further enhanced by removal of the thymus. (See Figure 3 and Table 4.)

During the "winter" period no differences among thymectomized (Group 4), sham thymectomized (Group 5) or unoperated

FIGURE 3

SEASONAL VARIATION OF ACID PHOSPHATASE ACTIVITY
IN TOTAL VENTRAL PROSTATE GLAND RESPONSES
TO THYMECTOMY AND SHAM THYMECTOMY



Significant differences:

"Summer" (Grps. 1 - 3) > "Winter" (Grps. 4 - 6), $.001 < p < .01$

T - "summer" > T - "winter", $.001 < p < .01$

S - "summer" > S - "winter", $.01 < p < .05$

(U - "summer" > U - "winter", $.10 > p > .05?$)

TABLE 4

VENTRAL PROSTATE GLAND - ACID AND ALKALINE PHOSPHATASES
(Means and Standard Errors)

Surgical State	<u>Acid Phosphatase</u>		<u>Alkaline Phosphatase</u>	
	<u>Units</u> <u>per Gram</u>	<u>Units</u> <u>per Organ</u>	<u>Units</u> <u>per Gram</u>	<u>Units</u> <u>per Organ</u>
<u>Uninjected "summer" animals (Groups 1 - 3)</u>				
T (Group 1) n	0.62 ± .02 11	0.092 ± .005 13	2.08 ± .13 11	0.308 ± .019 13
S (Group 2) n	0.63 ± .03 13	0.076 ± .006 14	2.10 ± .14 13	0.251 ± .022 14
U (Group 3) n	0.62 ± .04 14	0.072 ± .008 14	2.31 ± .29 14	0.264 ± .035 14
<u>Uninjected "winter" animals (Groups 4 - 6)</u>				
T (Group 4) n	0.40 ± .13 3	0.043 ± .011 3	1.41 ± .12 3	0.141 ± .022 3
S (Group 5) n	0.42 ± .08 5	0.044 ± .012 7	1.56 ± .28 5	0.169 ± .034 7
U (Group 6) n	0.56 ± .10 3	0.042 ± .004 4	1.89 ± .42 3	0.143 ± .016 4

TABLE 4 - 2

Surgical State	<u>Acid Phosphatase</u>		<u>Alkaline Phosphatase</u>	
	<u>Units</u> <u>per Gram</u>	<u>Units</u> <u>per Organ</u>	<u>Units</u> <u>per Gram</u>	<u>Units</u> <u>per Organ</u>
<u>Saline injected "summer" animals (Groups 7 - 9)</u>				
T+saline (Group 7) n	0.69 ± .04 8	0.100 ± .010 8	2.25 ± .27 8	0.326 ± .043 8
S+saline (Group 8) n	0.83 ± .06 9	0.105 ± .009 9	2.68 ± .21 9	0.344 ± .035 9
U+saline (Group 9) n	0.69 ± .04 9	0.091 ± .006 9	2.60 ± .37 9	0.339 ± .038 9
<u>Testosterone injected "summer" gonadectomized animals (Groups 10 - 12)</u>				
T+Gx (Group 10) n	0.69 ± .06 16	0.057 ± .005 20	2.77 ± .23 16	0.228 ± .030 20
S+Gx (Group 11) n	0.66 ± .04 14	0.057 ± .008 20	2.60 ± .23 14	0.215 ± .030 20
Gx (Group 12) n	0.68 ± .05 15	0.054 ± .005 23	2.92 ± .17 15	0.240 ± .028 23

TABLE 4 - 3

Surgical State	<u>Acid Phosphatase</u>		<u>Alkaline Phosphatase</u>	
	<u>Units</u> <u>per Gram</u>	<u>Units</u> <u>per Organ</u>	<u>Units</u> <u>per Gram</u>	<u>Units</u> <u>per Organ</u>
<u>Cortisone acetate injected "summer" adrenalectomized animals (Groups 13 - 15)</u>				
T+Adx (Group 13) n	0.65 ± .03 14	0.085 ± .009 15	2.34 ± .28 14	0.288 ± .033 15
S+Adx (Group 14) n	0.57 ± .05 11	0.074 ± .009 12	2.32 ± .21 11	0.289 ± .025 12
Adx (Group 15) n	0.65 ± .04 10	0.083 ± .007 11	2.42 ± .33 10	0.298 ± .036 11

animals (Group 6) in ventral prostate gland weight or acid and alkaline phosphatase activities per organ are apparent from the available data. However, there is a tendency for thymectomy and sham thymectomy to reduce acid and alkaline phosphatase activities per gram of ventral prostate gland. (See Table 4.)

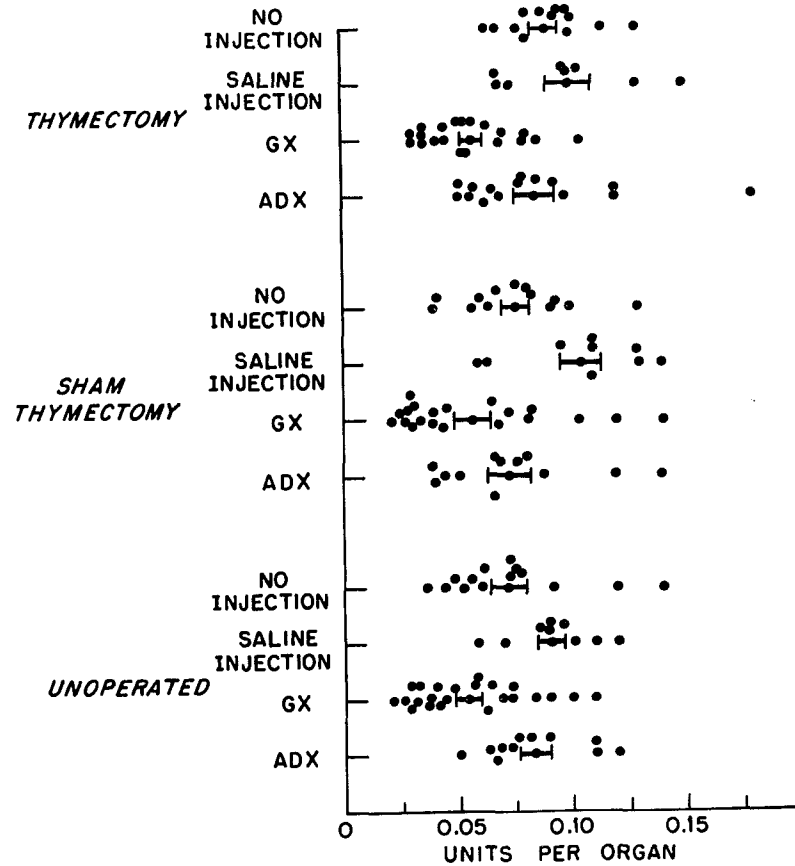
Saline injected "summer" animals (Groups 7 - 9).---Saline injections tend to increase acid and alkaline phosphatase activities per gram and per organ (See Table 4 and Figure 4). The differences between injected and uninjected animals are greatest in sham operated animals (Group 8 > Group 2).

Saline injection obscures the response to thymectomy. No differences among the saline injected animals in acid and alkaline phosphatases per organ are apparent.

Testosterone injected gonadectomized "summer" animals (Groups 10 - 12).---Gonadectomized animals receiving testosterone injections (Groups 10 - 12) and uninjected "summer" animals (Groups 1 - 3) have similar acid and alkaline phosphatase activities per gram of ventral prostate gland (Table 4). It appears that the dose of testosterone administered to gonadectomized animals is sufficient to maintain acid and alkaline phosphatase activities per gram of ventral prostate gland at a level comparable to that of animals with intact gonads, but does not maintain organ weights. Thus, enzyme activities per organ are lower in gonadectomized animals receiving testosterone than in intact animals. (See Figure 4 and Table 4.)

FIGURE 4

EFFECT OF SURGICAL AND HORMONAL TREATMENT
ON ACID PHOSPHATASE ACTIVITY
IN TOTAL VENTRAL PROSTATE GLAND



Significant differences:

Saline Injected (Grps. 7-9) > Uninjected (Grps. 1-3),
.001 < p < .01

S+saline > S-uninjected, .01 < p < .05

Gx (Grps. 10-12) < Intact+saline (Grps. 7-9), p < .001

T+Gx < T+saline, .001 < p < .01

S+Gx < S+saline, p < .001

Gx < U+saline, .001 < p < .01

Adx (Grps. 13-15) < Intact+saline (Grps. 7-9), .01 < p < .05

S+Adx < S+saline, .01 < p < .05

Gonadectomy appears to eliminate enzyme responses to surgery and injection. While thymectomized animals with intact gonads (Group 1) exhibited higher acid and alkaline phosphatase activities per organ than sham operated (Group 2) or unoperated animals (Group 3), no differences among thymectomized - gonadectomized (Group 10), sham thymectomized-gonadectomized (Group 11) and gonadectomized animals (Group 12) in enzyme activities per organ are observed. Sham thymectomized animals receiving saline injections (Group 8) had higher acid and alkaline phosphatase activities per gram and per organ than did thymectomized (Group 7) or unoperated animals (Group 9) receiving saline injections. No such response to injection is observed in sham thymectomized - gonadectomized animals.

Cortisone acetate injected adrenalectomized "summer" animals (Groups 13 - 15).--Adrenalectomy appears to eliminate the effect of thoracic surgery or injection on acid and alkaline phosphatase activities. No differences among thymectomized - adrenalectomized (Group 13), sham thymectomized - adrenalectomized (Group 14) and adrenalectomized animals (Group 15) in acid or alkaline phosphatase activities per gram or per organ are evident. (See Figure 4; Table 4.)

Summary.-- Animals thymectomized during the "summer" period exhibit higher acid and alkaline phosphatase activities per organ than either sham operated or unoperated animals.

Saline injection tends to elevate acid and alkaline phosphatase activities per gram and per organ, but eliminates

the response to thymectomy.

Gonadectomy and adrenalectomy also eliminate the enzyme response to thymectomy as well as to injection.

Dorsolateral prostate gland: acid and alkaline phosphatases

Uninjected "summer" and "winter" animals (Groups 1 - 6).--

There is a suggestion that thymectomy reduces acid and alkaline phosphatase activities per gram of dorsolateral prostate gland during the "summer" months but not during the "winter" months (Table 5). Since organ weights are higher in thymectomized animals no differences among thymectomized (Group 1), sham thymectomized (Group 2) and unoperated animals (Group 3) in acid and alkaline phosphatase per organ are observed during the "summer" months.

There is little difference between "summer" and "winter" animals in enzyme activities, but the effect of thymectomy on enzyme activities is not apparent during the "winter" months.

Saline injected "summer" animals (Groups 7 - 9).--There is a suggestion that saline injection decreases acid phosphatase activity per gram of dorsolateral prostate gland except in thymectomized animals (Figure 5). However, saline injection tends to increase alkaline phosphatase activity per gram of dorsolateral prostate gland in thymectomized animals. (See

TABLE 5

DORSOLATERAL PROSTATE GLAND - ACID AND ALKALINE PHOSPHATASES
(Means and Standard Errors)

Surgical State	<u>Acid Phosphatase</u>		<u>Alkaline Phosphatase</u>	
	<u>Units</u> <u>per Gram</u>	<u>Units</u> <u>per Organ</u>	<u>Units</u> <u>per Gram</u>	<u>Units</u> <u>per Organ</u>
<u>Uninjected "summer" animals (Groups 1 - 3)</u>				
T (Group 1) n	0.33 ± .03 7	0.029 ± .003 8	0.66 ± .09 7	0.061 ± .011 8
S (Group 2) n	0.39 ± .03 7	0.029 ± .002 8	0.85 ± .13 7	0.063 ± .008 8
U (Group 3) n	0.39 ± .04 6	0.029 ± .004 8	0.80 ± .12 6	0.058 ± .009 8
<u>Uninjected "winter" animals (Groups 4 - 6)</u>				
T (Group 4) n	0.36 ± .06 2	0.021 ± .004 5	0.81 ± .07 2	0.048 ± .008 5
S (Group 5) n	0.32 ± .05 5	0.020 ± .004 7	0.90 ± .06 5	0.056 ± .009 7
U (Group 6) n	0.36 ± .06 2	0.016 ± .002 3	0.84 ± .00 2	0.039 ± .011 3

TABLE 5 - 2

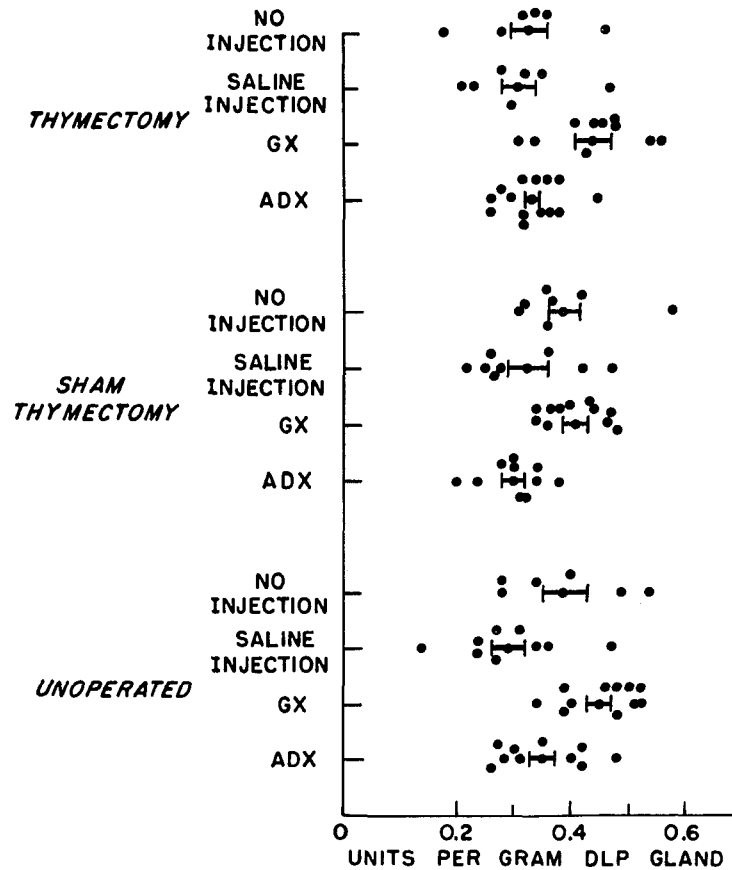
Surgical State	<u>Acid Phosphatase</u>		<u>Alkaline Phosphatase</u>	
	<u>Units</u> <u>per Gram</u>	<u>Units</u> <u>per Organ</u>	<u>Units</u> <u>per Gram</u>	<u>Units</u> <u>per Organ</u>
<u>Saline injected "summer" animals (Group 7 - 9)</u>				
T+saline (Group 7) n	0.31 ± .03 7	0.028 ± .004 8	0.86 ± .10 7	0.077 ± .009 8
S+saline (Group 8) n	0.32 ± .03 8	0.026 ± .003 9	0.82 ± .11 8	0.069 ± .011 9
U+saline (Group 9) n	0.29 ± .03 9	0.024 ± .002 10	0.71 ± .05 9	0.059 ± .007 10
<u>Testosterone injected "summer" gonadectomized animals (Group 10 - 12)</u>				
T+Gx (Group 10) n	0.44 ± .02 10	0.029 ± .003 12	0.67 ± .06 10	0.046 ± .008 12
S+Gx (Group 11) n	0.41 ± .02 11	0.027 ± .003 14	0.58 ± .07 11	0.040 ± .008 14
Gx (Group 12) n	0.45 ± .02 11	0.027 ± .003 16	0.58 ± .06 11	0.034 ± .005 16

TABLE 5 - 3

Surgical State	<u>Acid Phosphatase</u>		<u>Alkaline Phosphatase</u>	
	<u>Units</u> <u>per Gram</u>	<u>Units</u> <u>per Organ</u>	<u>Units</u> <u>per Gram</u>	<u>Units</u> <u>per Organ</u>
<u>Cortisone acetate injected "summer" animals (Group 13 - 15)</u>				
T+Adx (Group 13) n	0.33 ± .01 14	0.033 ± .003 15	0.97 ± .06 14	0.095 ± .010 15
S+Adx (Group 14) n	0.30 ± .02 10	0.026 ± .002 12	0.79 ± .08 10	0.066 ± .008 12
ADX (Group 15) n	0.35 ± .02 10	0.032 ± .003 11	1.02 ± .07 10	0.094 ± .008 11

FIGURE 5

**EFFECT OF SURGICAL AND HORMONAL TREATMENT
ON ACID PHOSPHATASE ACTIVITY
IN THE DORSOLATERAL PROSTATE GLAND**



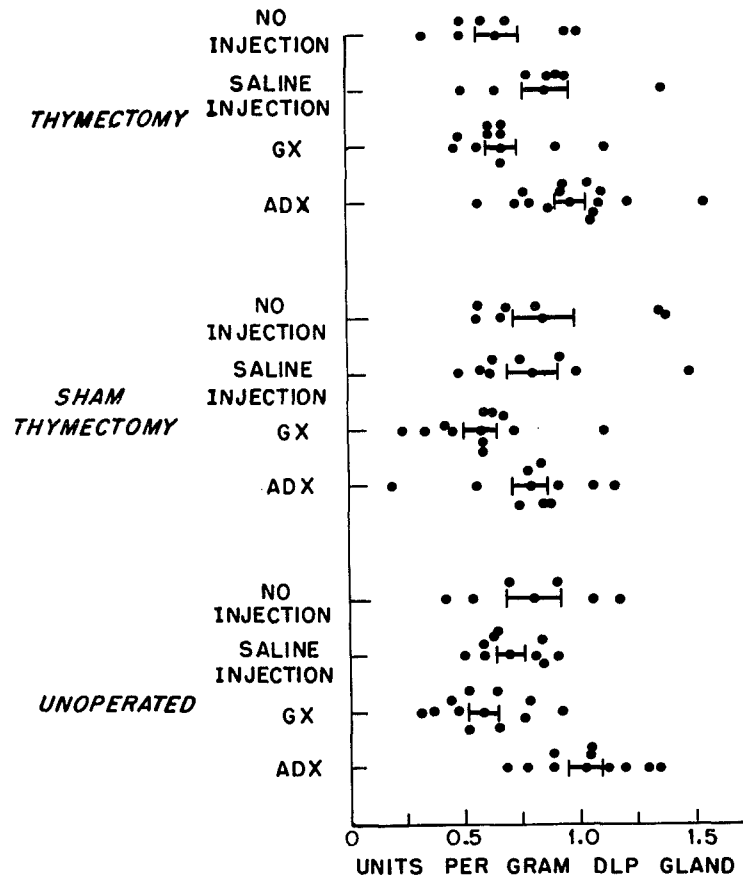
Significant differences:

Saline Injected < Uninjected, $.01 < p < .05$
 (Grps.7-9) (Grps.1-3)
 (U+saline < uninjected U, $.10 > p > .05$)

Gx (Grps.10-12) > Intact+saline(Grps.7-9), $p < .001$
 T+Gx > T+saline, $.001 < p < .01$
 S+Gx > S+saline, $.01 < p < .05$
 Gx > U+saline, $p < .001$

FIGURE 6

**EFFECT OF SURGICAL AND HORMONAL TREATMENT
ON ALKALINE PHOSPHATASE ACTIVITY
IN THE DORSOLATERAL PROSTATE GLAND**



Significant differences:

Gx(Grps.10-12) < Intact+saline(Grps.7-9), $.001 < p < .01$
 S+Gx < S+saline, $.01 < p < .05$

Adx(Grps.13-15) > Intact+saline(Grps.7-9), $.01 < p < .05$
 Adx > U+saline, $.01 < p < .05$

Figure 6; Group 7 > Group 1.)

Testosterone injected gonadectomized "summer" animals (Groups 10 - 12).--- Gonadectomy significantly increases acid phosphatase activity per gram of dorsolateral prostate gland (Groups 10 - 12 > Groups 7 - 9) and significantly decreases alkaline phosphatase activity per gram of dorsolateral prostate gland and per organ. (See Figures 5 and 6; Table 5.)

Cortisone acetate injected adrenalectomized "summer" animals (Groups 13 - 15).--- Adrenalectomy tends to increase alkaline phosphatase activity per gram of dorsolateral prostate gland in thymectomized (Group 13 > Group 7) and unoperated animals (Group 15 > Group 9). (See Figure 6.)

Summary.--- It is apparent that the enzyme activities of the dorsolateral prostate gland respond differently to the various treatments than do those of the ventral prostate gland.

Ventral prostate gland: citric acid

Since a seasonal variation in the responses of the ventral prostate gland to surgery was not predicted, no attempt was made to separate organs of "summer" and "winter" animals. In some cases a single determination contains both "summer" and "winter" organs. To have eliminated these determinations would have left little data. The citric acid determinations also include some animals whose weight and enzyme data are not reported in the present study for various reasons.

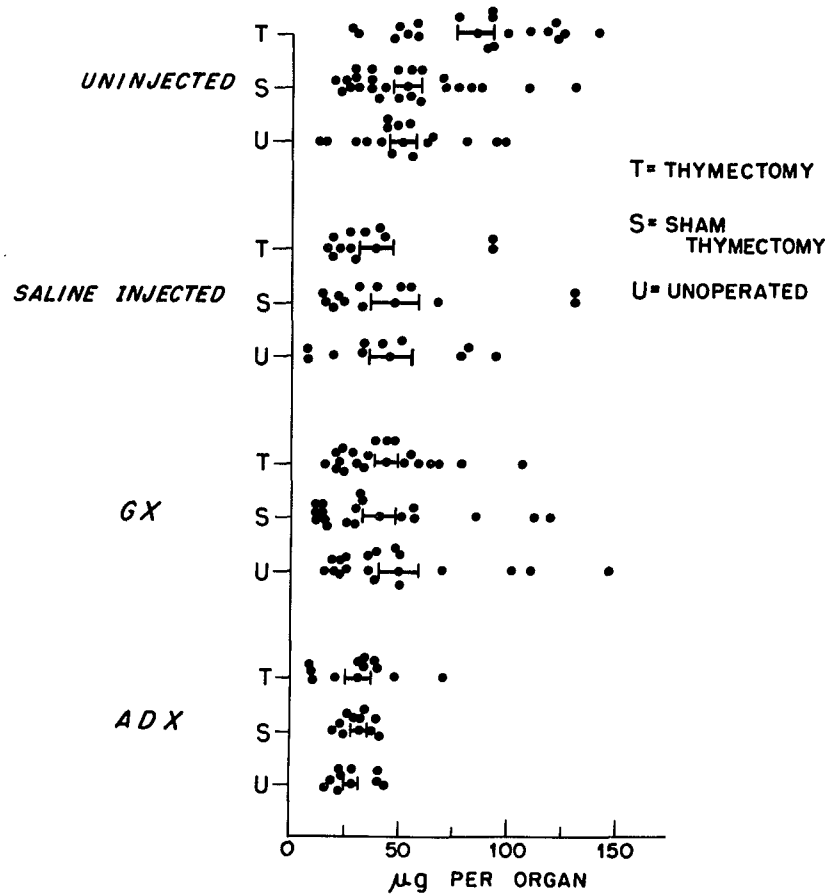
Therefore, only very general statements can be made about ventral prostate gland citric acid responses to various treatments.

Uninjected animals - "all seasons"-- Thymectomized animals having heavier ventral prostate glands than sham thymectomized or unoperated animals also have higher levels of citric acid per organ (Figure 7). There is also a suggestion of higher levels of citric acid per milligram of ventral prostate gland in thymectomized animals (Appendix Tables 47 - 49A).

Saline injected animals ("all seasons"); Testosterone injected gonadectomized animals; Cortisone acetate injected adrenalectomized animals.-- Saline injection, gonadectomy followed by testosterone injections and adrenalectomy with subsequent cortisone acetate injection all eliminate the effect of thymectomy on ventral prostate gland citric acid. (See Figure 7; Appendix Tables 50A - 58A.)

FIGURE 7

EFFECT OF SURGICAL AND HORMONAL TREATMENT
ON CITRIC ACID CONTENT
IN TOTAL VENTRAL PROSTATE GLAND



Significant differences:

Uninjected Animals - "All Seasons"
 $T > (S + U), p < .001$

Saline injected < Uninjected, $.001 < p < .01$
 $T + \text{saline} < \text{Uninjected } T, .001 < p < .01$

Adx < Intact + saline, $.01 < p < .05$

TABLE 6

EFFECTS OF VARIOUS TREATMENTS ON ORGAN WEIGHT,
ENZYME ACTIVITIES AND CITRIC ACID

Parameter	"Summer"		Gx	S+Gx	T+Gx	Adx
	S	T				
Ventral Prostate organ weight	+	+++	--	--	--	++
acid Pase/ gram	0	0	+	+	+	0
acid Pase/ organ	0	++	--	--	--	+
alk. Pase/ gram	-	-	+	+	+	+
alk. Pase/organ	-	+	-	--	--	+
citric acid/mg.	0	++	+	0	0	-
citric acid/organ	0	+++	0	- (slight)	-	-
Dorsolateral Prostate organ weight	0	++	-	- (slight)	-	++
acid Pase/ gram	0	-	+	0	+	- (slight)
acid Pase/organ	0	0	0	0	0	0
alk. Pase/gram	0	-	-	-	-	+
alk. Pase/organ	0	0	--	-	- (slight)	++
Seminal Vesicles	+	++	-	0	-	+++
Pituitary Gland	+	+	+++	+++	+++	- (slight)

NOTES: All comparisons made with uninjected unoperated "summer" animals(controls).
 + = designated group greater than controls.
 - = dsignated group parameter less than controls.
 0 = no appreciable difference between groups.

Acid Pase = acid phosphatase

Alk. Pase = alkaline phosphatase

TABLE 6 - CONTINUED

S+Adx	T+Adx	Saline Injected			"Winter"		
		U	S	T	U	S	T
++	++	+	+	++	-	0	-
- (slight)	0	+	++	+	- (slight)	-	-
0	+	++	++	++	-	-	-
0	0	+	+	0	-	-	-
+	+	+++	+++	+++	-	-	-
-	-	- (slight)	0	-	no data available		
-	-	0	0	-	no data available		
++	++	+	+	++	-	-	--
-	-	-	-	-	0	- (slight)	0
0	0	- (slight)	0	0	--	-	-
0	+	- (slight)	0	0	0	+	0
+	++	0	+	+	--	0	-
+++	++++	++	+	++	--	- (slight)	+
+	+	++	+	++	-	- (slight)	-

DISCUSSION

In the present study thymectomy markedly stimulated growth, total enzyme activity and citric acid content of prostate glands of 30 - 33 day old male rats when experiments were performed during the "summer" months. Sham thymectomy, adrenalectomy and saline injection exerted actions similar to those of thymectomy but of smaller magnitude. Gonadectomy and thymectomy, however, exerted opposite effects upon accessory sex structure growth.

In earlier experiments on somewhat older rats, Martin (1964a) observed that sham thymectomy retarded accessory sex structure growth. One possible explanation for this observation is that stimulation of the thymus via sham thymectomy leads to increased secretion of adrenal androgens.

The androgens generally attributed to the adrenal gland are regarded as predominantly weak androgens (Bardin and Peterson, 1967; Dorfman and Shipley, 1956). Weak androgens at a dosage level as effective as testosterone in suppressing release of gonadotrophins from the pituitary may provide less stimulation to the accessory sex structures than do more potent androgens (Hertz and Meyer, 1937). In animals of the age employed by Martin an increased secretion of adrenal androgens might result in delayed growth of accessory sex structures through suppression of gonadotrophin

release and consequent decreased secretion of testicular androgens. In animals 30 - 33 days of age, in which testicular androgen secretion is low, stimulation of adrenal androgen secretion might result in stimulated accessory sex structure growth. In the present study sham thymectomized animals were found to have somewhat heavier ventral prostate glands and seminal vesicles than did unoperated animals. Such a finding would be consistent with the suggestion that sham surgery results in increased adrenal androgen secretion.

If the effect of sham thymectomy on the accessory sex structures is related to activation of the thymus, thymectomy would be expected to eliminate the observed stimulation. However, in the present study thymectomized animals were found to possess heavier accessory sex structures than either sham operated or unoperated animals, suggesting that the thymus exerts an inhibitory effect upon accessory sex structure growth in intact animals. It is possible that sham surgery involves some stimulation of adrenal androgen secretion while thymectomy elicits even greater secretion.

If adrenal androgens are responsible for the stimulation of accessory sex structure growth observed in thymectomized and sham thymectomized animals, then adrenalectomy should abolish any differences among thymectomized, sham thymectomized and unoperated animals while the stimulation should persist in gonadectomized animals and might even be enhanced. There have been suggestions that gonadectomy in older animals is followed by increased adrenal androgen

secretion (Bardin and Peterson, 1967; Ofner, 1968).

In the present study adrenalectomy diminished differences among the groups through stimulation of animals not subjected to thymectomy or sham thymectomy. However, the data obtained from adrenalectomized animals must be interpreted with caution since mortality rates were excessive regardless of attempts at replacement therapy. The reasons for the high mortality rate are unknown but not without precedent. Grollman (1964) reported a higher mortality rate among young adrenalectomized rats than among older rats subjected to the same surgical procedure. Scrutiny of the data obtained from adrenalectomized animals also suggests a rather homogeneous population as evidenced by the narrow range of values. With these precautions in mind, since the general effect of adrenalectomy appears to be stimulation of accessory sex structure growth, it is suggestive of reduction of catabolic hormones rather than of increased secretion of anabolic hormones such as adrenal androgens.

In the present study castration eliminated any increase in accessory sex structure growth attributable to thymectomy or sham thymectomy on the dose of testosterone used, suggesting that intact testes are required for the observed stimulation. The dose of testosterone administered was quite small, but might have been sufficient to suppress adrenal androgen secretion. The findings do not rule out a role for adrenal androgens in the observed stimulation, but do suggest a greater role for testicular androgens.

It was surprising to find that saline injection obscured the accessory sex structure response to thymectomy and sham thymectomy, apparently by stimulating accessory sex structure growth in unoperated animals. The amount of saline injected was so small that it is unreasonable to attribute the effect of sham injection to the saline. It is conceivable that sham injection affects accessory sex structure growth via the central nervous system.

The central nervous system is known to influence the secretory activity of the pituitary gland. The release of both ACTH which stimulates the secretory activity of the adrenal cortex and of LH which stimulates testicular steroid secretion are influenced by the hypothalamus (McCann and Porter, 1969). Various stimuli have been shown to effect release of pituitary hormones via the central nervous system. Mating in the rabbit has been shown to decrease pituitary ACTH, LH and Prolactin, showing that a single stimulus can effect the release of several trophic hormones (McCann and Porter, 1969). Metcalf (1966) has reported that such relatively mild stimuli such as ear punching, etc. interfere with studies of the effects of thymus suspensions on lymphocyte growth. Surgical and other stresses have been shown to stimulate release of pituitary gonadotrophins and to result in precocious puberty (Martini and Ganong, 1966, v.1, p.342). Acute stresses, such as sham surgery, have been shown to stimulate secretion of ACTH (Vernikos-Danielis, 1963) and to produce catabolic effects on various structures, presumably due to increased glucocorticoid secretion (Selye,

1951). It is therefore conceivable that both saline injection and sham thymectomy affect the central nervous system eliciting the release of various trophic hormones from the pituitary gland. Both sham thymectomized and saline injected unoperated animals possess heavier pituitary glands than uninjected unoperated animals; a finding consistent with pituitary stimulation.

Thymectomized animals were also found to have heavier pituitary glands than sham operated or unoperated animals. Wherever thymectomy did not elicit an increase in accessory sex structure growth, no difference between thymectomized and sham thymectomized animals in pituitary gland weight was seen. These data are consistent with the suggestion that thymectomy leads to pituitary stimulation.

Early workers suggested that the thymus in some way inhibited sexual development, but were plagued by equivocal results. In most cases the investigators were concerned with the effects of thymectomy on growth of the testes (Andersen, 1932). Recent studies have indicated that modification of testis weight is a good indicator of altered secretion of FSH which stimulates proliferation of seminiferous tubules in the testis (Motta et al, 1967). It is conceivable that the thymus exerts a minimal effect on FSH secretion, in which case testis weight observations would be of limited value. On the other hand, Martin (1964a) has shown that removal of the thymus prevents the retardation of accessory sex structure growth observed in sham thymec-

tomized animals. In the present study thymectomy resulted in marked acceleration of accessory sex structure growth. Recent evidence suggests that prostate and seminal vesicle weight changes are good indicators of LH release from the pituitary gland, which then stimulates testicular androgen secretion (Motta et al, 1967). A very rapid period of prostate growth occurs in the rat between 30 and 40 days of age, at a time when pituitary LH content is seen to decrease markedly (Kragt and Ganong, 1968). The decrease in pituitary LH is believed indicative of release of the hormone from the gland.

It is possible that the thymus gland exerts an inhibitory effect upon LH release in the intact animal, possibly via the hypothalamus. Kincl et al (1965) found that thymus cell suspensions are capable of protecting neonatal animals against the sterilizing effects of exogenous sex steroids. The injected steroids are believed to interfere with the development of the hypothalamic centers controlling gonadotrophin release. The authors state that there is no evidence in the available literature suggesting a relationship between the thymus and the hypothalamus and that they cannot explain the observed effect of thymocytes. It is tempting, however, to speculate that such a relationship does exist.

One might propose that in animals 30 - 33 days of age, sham thymectomy acts as a stimulus to the release of trophic hormones via the hypothalamus. The interactions of the trophic hormones and the hormones of their target organs stimulate accessory sex structure growth. Removal of the

thymus would involve the effects of sham thymectomy, but an additional release of LH would occur producing a greater stimulus to accessory sex structure growth than sham surgery. Gonadectomy would eliminate the increased growth of accessory sex structures attendant upon thymectomy by removing the major source of androgen. In the present study gonadectomy with subsequent administration of testosterone prevented the stimulation of accessory sex structure growth observed in thymectomized and sham thymectomized animals, suggesting that altered secretion of testicular androgen is necessary for this effect.

One might also propose that any factor which would influence the animal's hormonal environment could alter the responses of the accessory sex structures to sham thymectomy and thymectomy; among these factors would be the presence of intact adrenals, the presentation of stimuli such as sham injection, age and as shall be discussed later, season of the year.

Many studies suggest that changes in the central nervous system and in the pituitary content of the various trophic hormones occur with age. Changes in the hypothalamus, altering release of pituitary gonadotrophins, are believed responsible for the onset of puberty (Martini and Ganong, 1966, v.1, p.10). Ability of various stresses to induce ACTH release varies at different ages (Palkovits and Mitro, 1968). Metcalf (1966) has reported that responses of young animals to procedures such as ear punching, etc. are

relatively greater than the responses of older animals to the same procedures. Pituitary concentration of LH in male rats has been shown to reach a peak at 30 days of age and to decrease thereafter (Lisk, 1968). Therefore, it is conceivable that pituitary stimulation would be more likely to elicit LH release in rats 30 - 33 days of age.

The same stimulus might produce different effects upon accessory sex structure growth in animals of different ages. Sham thymectomy and thymectomy of animals 30 - 33 days of age might be followed by the release of more hormones stimulatory to the accessory sex structures. On the other hand, sham thymectomy of animals 6 - 6½ weeks of age may elicit release of more hormones catabolic to the accessory sex structures or may decrease release of LH resulting in the retardation of accessory sex structure growth as observed by Martin (1964a). Thymectomy of animals 6 - 6½ weeks of age might be followed by increased release of LH overcoming the effects of the catabolic hormones on the accessory sex structures and resulting in organs comparable in size to those of unoperated animals.

Since the accessory sex structures of the rat are comprised of several types of tissue and may contain varying amounts of fluid, wet weights provide a limited amount of information about the changes produced in these structures by hormonal and surgical treatments. It was hoped that measurements of citric acid content and acid and alkaline phosphatase activities might provide additional information

regarding the types of changes occurring.

Histochemical studies have shown that acid phosphatase is localized in the secretory epithelium of the rat prostate, largely associated with secretory granules, and in the prostatic secretion (Brandes, 1966). Changes in the acid phosphatase activity of the prostate would be indicative of altered secretory activity.

Alkaline phosphatase activity can be demonstrated in the periacinar stromal tissues of the rat prostate and in the walls of small blood vessels contained within the stroma (Brandes and Bourne, 1954). Shimazaki et al (1969) interpret changes in prostatic alkaline phosphatase activities as alterations in supporting tissues. Little alkaline phosphatase is found in the prostatic secretion (Mann, 1964).

Citric acid is found in the prostatic secretion and in the secretory epithelium of the rat ventral prostate gland (Mann, 1964).

The data regarding prostate weight, enzyme activities and citric acid levels in thymectomized animals support the contention that the changes observed upon removal of the thymus represent genuine metabolic alterations rather than mere fluid accumulation. Thymectomized animals having significantly heavier ventral prostate glands than sham thymectomized or unoperated animals also have higher activities of acid and alkaline phosphatases per organ as well as higher total citric acid content in the ventral prostate. Although sham thymectomized animals were found to have some-

what heavier accessory sex structures than unoperated animals, no marked differences between the groups in activities of acid and alkaline phosphatase per gram of ventral prostate gland or per organ existed. Since weight differences were small, no marked differences in total enzyme content would be expected. Histological studies might clarify the types of changes following thymectomy and sham thymectomy, since no attempt was made to distinguish hypertrophy from hyperplasia in the present study.

The data are also consistent with the suggestion that thymectomy is followed by changes in circulating androgen levels, possibly as a result of increased secretion of gonadotrophins. In the rat, ventral prostate citric acid and acid and alkaline phosphatases appear to be under androgenic control (Young, 1961, p.388). Administration of testosterone to intact rats results in heavier prostate glands, increased citric acid levels (Mann, 1964) and greater total content of acid and alkaline phosphatases. Testosterone is without effect on the concentrations of these enzymes in the prostates of intact rats (Gutman and Gutman, 1938; Kirchheim and Scott, 1965). The findings in thymectomized animals in the present study are similar to those described as following androgen administration in rats with intact gonads.

Gonadectomy is followed by a reduction in alkaline phosphatase activity in the prostatic stroma as determined histochemically (Brandes and Bourne, 1954; Kirchheim and Scott, 1965) although the reaction remains in the walls of

the periacinar blood vessels (Brandes, 1966).

Reports of the effects of gonadectomy on acid phosphatase concentrations in the prostates are somewhat contradictory. The method of enzyme determination employed and time after gonadectomy would appear to be important factors in the concentrations of acid phosphatase found.

Stafford et al (1949), using biochemical methods, reported a decrease in acid phosphatase activity per unit weight of tissue in the ventral prostate glands of rats gonadectomized 8 days prior to sacrifice. Butler and Schade (1958), also employing a biochemical determination, reported no effect of gonadectomy after periods of from one to six weeks on prostatic acid phosphatase activity.

Histochemical studies have shed some light on these contradictory findings. The distribution of acid phosphatase in rats gonadectomized for three to four weeks differs from that observed in intact rats. Acid phosphatase is largely found in discrete secretory granules in the acinar cells of intact rats. In gonadectomized animals there is a marked reduction in the number of these fine granules, while a marked increase in acid phosphatase activity localized in large, dense granules with the characteristics of lysosomes is observed (Brandes et al, 1962; Kirchheim and Scott, 1965).

There is a considerable body of evidence suggesting a role for lysosomes in cellular degradation (Brandes, 1966; Lobel et al, 1961). The number of lysosomes in the rat prostate increases after gonadectomy (Brandes, 1966) and

may play a role in the observed atrophy of the organ.

A decrease in the concentration of acid phosphatase, determined biochemically, may occur a short time after gonadectomy due to removal of androgen stimulation leading to decreased acid phosphatase associated with secretory granules. Studies of longer duration might detect either an increase or no change in the concentration of prostatic acid phosphatase due to increased synthesis or more probably decreased turnover of lysosomal enzymes (Brandes, 1966). If the studies were even more prolonged and the prostate atrophied to its fullest extent, one might again observe a decreased concentration of acid phosphatase due to decreased synthesis of lysosomal enzymes (Brandes, 1966).

In the present study of three weeks duration, gonadectomy and subsequent testosterone administration eliminated the effects of thymectomy on accessory sex structure growth, enzyme activities and citric acid content. The data support the contention that altered testicular secretion is involved in the accessory sex structure response to thymectomy. Animals with intact gonads might respond to thymectomy with increased circulating levels of testosterone or by secreting androgens other than testosterone in increased amounts. The rat testis is known to secrete androstenedione and other steroids in addition to testosterone. In the immature rat the amount of androstenedione secreted exceeds that of testosterone. The ratio is reversed at puberty (Tienhoven, 1968, p.77). Therefore, testicular secretions other than

testosterone are important in the young rat and may play a role in the response to thymectomy.

Studies involving steroid and trophic hormone determinations would be of value in testing the various explanations proposed for the effects of thymectomy. Such studies would also provide information as to the hormonal changes produced by the various treatments involved in the present study and perhaps clarify the reasons for the diminished effect of thymectomy on accessory sex structure growth in saline injected and adrenalectomized animals.

The effects of the various surgical and hormonal treatments on acid and alkaline phosphatase activities are also consistent with the following:

1. The various accessory sex structures of the same animal respond differently to the various treatments, and
2. Thymectomized, sham thymectomized and unoperated animals represent three different hormonal states as evidenced by differences in their responses.

There is a considerable body of evidence that ventral and dorsolateral prostate glands differ in their metabolic makeup and respond differently to hormones. Bern and Levy (1952) reported that the ventral prostate gland of the rat has a higher concentration of alkaline phosphatase than does the dorsolateral prostate gland and that the phosphatases in the various lobes of the prostate react differently to sex steroids. Grayhack (1965) has shown that testosterone pro-

duces a greater increase in the citric acid content of the ventral than of the dorsal prostate gland. Concomitant administration of estrogen and testosterone produce an effect on the citric acid of these two lobes similar to that produced by testosterone alone. On the other hand, estrogen enhanced the effect of testosterone on the citric acid content of the lateral prostate. Grayhack and Lebowitz (1967) reported a synergistic effect of prolactin and testosterone on citric acid content and weight of the lateral prostate, while these hormones are not synergistic on the ventral lobe.

In the present study thymectomized animals have somewhat lower activities of acid and alkaline phosphatases per gram of dorsolateral prostate gland than either sham thymectomized or unoperated animals. Since thymectomized animals have somewhat heavier dorsolateral prostate glands, no differences in total enzyme content are observed. On the other hand, both thymectomy and sham thymectomy appear to decrease alkaline phosphatase activity per gram of ventral prostate gland. Since both surgical procedures stimulate ventral prostate gland growth to different extents, there are no differences between sham thymectomized and unoperated animals in enzyme activities per organ, while thymectomized animals have higher enzyme activities per organ.

Thymectomized, sham thymectomized and unoperated animals respond differently to saline injections. Saline injection appears to stimulate accessory sex structure growth

in unoperated animals. Saline injected unoperated animals also have higher activities of acid and alkaline phosphatase per gram of ventral prostate gland and per organ than do their uninjected counterparts. On the other hand, saline injection appears to decrease acid phosphatase activity per gram of dorsolateral prostate gland in unoperated animals.

While there is little effect of saline injection on organ weights in sham thymectomized animals, acid and alkaline phosphatase activities per gram of ventral prostate gland and per organ are markedly increased and acid phosphatase activity per gram of dorsolateral prostate gland is decreased.

Saline injections administered to thymectomized animals tend to retard ventral prostate gland growth although acid and alkaline phosphatase activities per gram of ventral prostate gland and per organ are somewhat increased. The increased acid phosphatase activity might represent increased lysosomal enzyme responsible for the observed retardation of prostate growth. While saline injection appears without effect upon dorsolateral prostate gland weight in thymectomized animals, alkaline phosphatase activity per gram of dorsolateral prostate gland is increased.

While gonadectomy and subsequent androgen administration are without effect on enzyme activities per gram of ventral prostate gland, gonadectomized animals receiving testosterone have higher activities of acid phosphatase per gram of dorsolateral prostate gland than do their counterparts with intact gonads. On the other hand, alkaline phos-

phatase activity per gram of dorsolateral prostate gland is decreased in castrated animals receiving testosterone. It is possible that the increased acid phosphatase activity represents increased degradative activity. These findings suggest that the administered testosterone does not mimic the hormonal situation in the intact animal, and confirms previous findings that the hormonal requirements of the dorsolateral prostate differ from those of the ventral prostate gland.

While adrenalectomy and subsequent cortisone acetate administration are without effect upon enzyme activities of the ventral prostate gland, these procedures increase the alkaline phosphatase activity per gram of dorsolateral prostate gland in thymectomized animals and in animals not subjected to thoracic surgery. The data are suggestive of alterations in the stromal elements of the prostate following adrenalectomy and cortisone acetate administration.

A seasonal variation in prostate responses to thymectomy is one of the more interesting findings of the present study. During the "summer" months thymectomy is followed by a marked stimulation of accessory sex structure growth. Thymectomized animals have heavier ventral prostate glands with higher activities of acid and alkaline phosphatases per organ and higher total citric acid content than either sham thymectomized or unoperated animals. Thymectomized animals also have heavier dorsolateral prostate glands than do the other two groups, but acid and alkaline phosphatases per gram

of dorsolateral prostate gland were lower in thymectomized animals.

While animals during the "summer" period respond to thymectomy with increased accessory sex structure growth, "winter" animals do not. Animals thymectomized during the "summer" months also have heavier ventral and dorsolateral prostate glands as well as higher concentrations of acid and alkaline phosphatases in the ventral prostate gland than do animals thymectomized during the "winter" months. While "winter" animals had lower initial and final body weights than did "summer" animals, differences in ventral prostate gland weights appear to involve some factor other than body weight differences. Decreased accessory sex organ size and enzyme concentrations during the "winter" period are suggestive of decreased androgen stimulation. A seasonal variation in the responses of the accessory sex structures to hormones and/or a seasonal variation in the secretion of androgens and gonadotrophins may exist.

There are a number of reports in the literature of seasonal variations in the responses of reproductive structures of domesticated animals to hormones. McCormack and Elden (1945) reported a seasonal variation in the responses of the rabbit ovary to pituitary extracts. Using follicle rupture as their end point the authors reported an increased sensitivity to pituitary extracts in July-August and January-February. Prolactin has been found to stimulate the growth rate of seminal vesicles of Sprague-Dawley rats in organ

culture during the summer (June-September) but not during the winter months (November-January; Reddi, 1969).

Gunn and Gould (1958) reported a seasonal variation in the ability of the dorsolateral prostate gland of the laboratory rat to concentrate zinc-65. The peaks of zinc-65 uptake were seen in February-March and June-July. The authors suggest that the cycle of responsiveness of the accessory sex structures may reflect an archaic reproductive cycle. The role of zinc in reproduction has been discussed by several authors (Schrodt, 1963; Whitmore, 1963).

Richter and Uhlenhuth (1954) reported high reproductive rates in wild rats in July-September and low rates in November-January. The variations reported in domesticated rats with season correlate with reported breeding cycles in the wild state. Thus, although the laboratory rat breeds throughout the year seasonal variations in reproductive structures occur as a remnant of a breeding cycle in the wild state. Animals in the colony used in the present study appear to have fewer litters during the winter than during the summer months. The winter litters generally contain fewer animals with lower body weights than litters during the summer.

One of the factors implicated in the regulation of seasonal breeding cycles is environmental lighting. The junco finch with a yearly breeding cycle exhibits gonadal growth in the early spring and gonadal atrophy in the autumn. Extension of daylight periods with artificial illumination

causes premature gonadal growth. Artificial lengthening of the daylight period hastens the onset of the breeding season in the ferret as well. Exposure of rats to prolonged illumination also influences gonadal function (Wurtman et al, 1968).

Since the room in which the animals in the present study were housed was controlled for temperature and humidity but not for lighting, animals were exposed to longer periods of light during the "summer" period than during the "winter" period. Therefore one of the factors involved in the seasonal variation in responses to thymectomy might be the changing periods of light to which the animals were exposed.

There is a considerable body of evidence that the pineal gland mediates an organism's responses to light. Changes in pineal histology, enzyme levels and other biochemical constituents occur with changes in lighting (Wurtman et al, 1968). Recent reports suggest that the pineal gland exerts an inhibitory influence on the gonads. Pinealectomy of mature male rats results in increased weight of testes, ventral prostate glands and seminal vesicles suggestive of an increased release of LH and FSH (Motta et al, 1967). Blinding of young rats results in retarded testis growth (Reiter, 1968).

One of the pineal factors implicated in the antigonadal effects of the pineal is melatonin. The synthesis of melatonin is inhibited during light periods (Wurtman et al, 1968).

Injection of melatonin into 30 day old rats for 3 weeks is followed by atrophy of prostates and seminal vesicles suggestive of decreased secretion of LH (Motta et al, 1967). Tait et al (1969) report that the melatonin content of the pineal gland is very high in rats until about the sixteenth day of life, when it markedly decreases. Since the eyes of the rat open between fourteen and seventeen days postpartum, the authors believe that the entrance of light may be involved in a decreased synthesis of melatonin. After the sixteenth day of life, testis size and testicular androgen biosynthesis increase markedly. The authors suggest a relationship between the pineal and testis function.

It would appear that the pineal gland, activated by darkness, secretes one or more substances which exert an inhibitory effect on gonadal function possibly by suppressing release and/or synthesis of gonadotrophins.

One might propose that in the present study exposure of animals to increasing periods of darkness during the "winter" period activated the pineal gland. The pineal secreted substances which inhibited secretion and/or synthesis of gonadotrophins. Friedman and Friedman (1939) reported that the pituitary content of gonadotrophin is highest in early spring and lowest in early winter. Thymectomy during the "winter" period might produce no increases in accessory sex structure growth since the pineal is strongly inhibiting the release and/or synthesis of gonadotrophins. The antigonadotrophic effect of the pineal might also interfere with the normal release of gonadotrophins

resulting in decreased accessory sex structure size and enzyme concentration during the "winter" period.

On the other hand, during the "summer" period of increased lighting the pineal may be inhibited and exert little effect, as evidenced by larger accessory sex structures and increased enzyme concentrations. Removal of the thymus during this period would result in marked stimulation of accessory sex structure growth. It is conceivable that the thymus is an important regulator of gonadal activity, exerting an inhibitory effect on gonadotrophin secretion during the "summer" period while during the "winter" period the pineal becomes the more important inhibitor.

It is of interest that recent studies show that pineal-ectomy is without effect upon the gonadal atrophy produced by neonatal administration of androgen to male and female rats. Androgen administered in such a manner interferes with the development of the hypothalamo-pituitary axis (Reiter et al, 1968). Kincl et al (1965) reported that administration of thymus cell suspensions prevented steroid induced sterility in neonatal rats. Is it possible that both the thymus and the pineal inhibit gonadotrophin secretion but by different mechanisms?

An alternative explanation for "summer"- "winter" differences is also possible. Perhaps an inherent cycle of pituitary gonadotrophin synthesis and release exists quite independent of the pineal gland. When pituitary content of gonadotrophin is high, as in the early spring (Friedman and

Friedman, 1939), removal of the thymus would result in greater release of gonadotrophin merely because there is more available. During the "winter" period , when pituitary content of gonadotrophin is low (Ibid.), thymectomy would have a lesser effect on gonadal and accessory sex structure function.

APPENDIX

TABLE 1A

RESULTS OF THE KOLMOGOROV-SMIRNOV TEST OF GOODNESS-OF-FIT
OF DATA TO THE NORMAL CURVE¹

<u>Group No.</u>	<u>Parameter or Organ</u>	<u>n</u>	<u>D_s</u>
1	V.P.	14	0.246
1	S.V.	14	0.161
2	V.P.	15	0.147
3	V.P.	15	0.078
3	S.V.	15	0.080
4	V.P.	5	0.107
4	S.V.	5	0.242
5	S.V.	7	0.277
6	V.P.	5	0.224
7	V.P.	9	0.090
7	V.P.-acid phosphatase <u>per organ</u>	8	0.216
7	S.V.	9	0.190
8	V.P.	10	0.179
8	S.V.	10	0.167
9	V.P.	11	0.053
9	S.V.	11	0.211
10	V.P.	20	0.145
10	S.V.	20	0.182
11	V.P.	21	0.180
11	V.P.-acid phosphatase <u>per organ</u>	20	0.232
11	S.V.	21	0.283* non- normal
12	V.P.	23	0.204

TABLE 1A - 2

<u>Group No.</u>	<u>Parameter or Organ</u>	<u>n</u>	<u>D_s</u>
12	V.P.-acid phosphatase <u>per gram</u>	15	0.181
12	S.V.	23	0.264 (non- normal?; .10>p>.05)
13	V.P.	15	0.124
13	S.V.	15	0.143
14	V.P.	12	0.220
14	S.V.	12	0.147
15	V.P.	12	0.196
15	V.P.-acid phosphatase <u>per gram</u>	10	0.108
15	V.P.-acid phosphatase <u>per organ</u>	11	0.145
15	S.V.	12	0.062

NOTES: 1 $D_s = \text{test statistic} = \frac{d_{\max.}}{n}$ $n = \text{number of samples}$

$d_{\max.}$ = maximum deviation of observed frequency
from that predicted from normal curve.
(Sokal and Rohlf, 1969, pp.572-575)

Values of D_s were compared with critical values of D as listed in the CRC Handbook of Tables for Probability and Statistics (Beyer, ed., 1966, pp.321-22). Wherever D_s exceeded the value of D at the 0.05 per cent level of probability, normality was rejected.

TABLE 2A

GROUP 1 - UNINJECTED THYMECTOMIZED ANIMALS - "SUMMER"

Organ Weights in Milligrams

Rat No.	Body Wt. (g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
	Init.	Final									
1	86	164	151	102	222	50	2269	1729	36	-	-
2	82	183	126	101	108	35	2192	1765	35	-	-
3	75	158	203	87	154	54	2245	1609	32	-	-
4	77	152	122	80	100	27	2490	1680	38	-	-
5	75	173	126	71	110	32	2400	1679	29	-	-
6	65	156	147	89	115	54	1756	1377	44	-	-
7	64	163	156	104	249	52	1993	1534	30	-	6.2
8	79	170	158	106	169	42	1397	1578	39	-	8.6
9	60	154	118	81	103	37	1897	1392	30	-	7.1
10	62	189	177	120	203	32	1935	1689	35	-	7.8
16	64	172	123	45	53	16	1481	1616	26	-	7.2

(Continued)

TABLE 2A - Continued

Organ Weights in Milligrams

Rat No.	Body Wt.(g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
	Init.	Final									
17	66	147	163	95	180	40	1829	1520	26	-	6.5
18	72	197	156	98	219	48	1907	1764	26	-	7.3
19	73	179	120	90	163	38	2083	1821	32	-	7.1
Mean	71	168	146	91	153	40	1991	1625	33	-	7.2
S.E.	2.15	3.96	6.73	4.85	15.3	2.98	85.2	36.0	1.45	-	0.26

TABLE 3A

GROUP 2 - UNINJECTED SHAM THYMECTOMIZED ANIMALS - "SUMMER"

Organ Weights in Milligrams

Rat No.	Body Wt.(g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
	Init.	Final									
20	82	151	118	73	92	32	2301	1448	29	216	-
21	73	147	135	77	133	23	2225	1533	27	385	-
22	64	176	99	69	93	44	2005	1466	34	570	-
23	46	142	80	59	67	29	1616	1321	28	346	-
24	66	196	99	70	107	29	1838	1856	21	342	-
25	60	144	150	68	99	36	2088	1417	36	272	-
26	86	166	138	65	67	28	2323	1588	30	371	7.0
27	64	155	105	83	181	51	2033	1517	27	577	9.2
28	83	177	161	108	129	45	1899	1596	38	406	7.7
29	62	140	72	37	88	19	1818	1169	22	318	1.9
30	61	160	108	53	169	30	1971	1534	32	431	6.6
31	65	181	136	74	112	omit one lost	2225	1683	30	667	7.6

(Continued)

TABLE 3A - Continued

Organ Weights in Milligrams

Rat No.	Body Wt. (g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
	Init.	Final									
39	63	176	165	67	139	30	2288	1482	30	438	6.9
40	68	165	121	87	193	41	2103	1300	31	492	-
41	68	188	137	77	132	28	1866	1873	27	662	5.6
Mean	67	164	122	71	120	33	2040	1519	30	433	6.6
S.E.	2.64	4.57	7.18	4.11	10.0	2.41	54.0	49.1	1.18	35.2	0.76

TABLE 4A
GROUP 3 - UNINJECTED UNOPERATED ANIMALS - "SUMMER"

Rat No.	Body Wt.(g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
	Init.	Final									
42	78	158	100	65	81	30	2050	1551	29	291	-
43	74	125	84	47	45	15	2027	1287	39	333	-
44	76	168	110	61	67	25	2258	1480	38	381	-
45	52	160	71	68	98	35	1857	1280	35	478	-
46	47	170	130	98	127	37	1960	1520	28	420	-
47	73	168	94	56	79	25	1501	1515	30	484	-
48	57	142	136	66	96	33	1983	1364	31	347	-
49	59	155	94	75	156	42	1665	1722	25	459	7.8
50	78	199	202	107	190	60	2222	1964	31	364	10.4
51	66	139	68	48	51	10	1582	1161	27	287	2.4
52	61	149	102	50	123	27	1994	1406	29	407	6.2
53	64	190	150	108	101	38	2045	1834	33	585	5.3

(Continued)

TABLE 4A - Continued

Organ Weights in Milligrams

Rat No.	Body Wt.(g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
	Init.	Final									
59	61	125	97	37	32	12	1834	1144	31	225	4.9
60	68	167	140	110	191	40	2231	1540	31	613	4.7
61	67	174	120	84	109	31	1907	1811	24	433	7.2
Mean	65	159	113	72	103	31	1941	1505	31	407	6.1
S.E.	2.43	5.46	8.94	6.25	12.5	3.31	58.4	63.3	1.09	27.7	0.85

TABLE 5A

GROUP 4 - UNINJECTED THYMECTOMIZED ANIMALS - "WINTER"

Organ Weights in Milligrams

Rat No.	Body Wt.(g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
	Init.	Final									
11	63	153	98	62	155	35	1869	1545	29	-	6.8
12	62	168	108	84	223	36	1923	1553	34	-	7.4
13	62	117	90	55	66	22	1608	1027	24	-	3.9
14	62	144	131	64	104	24	1955	1709	38	-	6.1
15	53	111	69	34	40	16	1647	913	20	-	4.8
Mean	60	139	99	60	118	27	1800	1349	29	-	5.8
S.E.	1.85	10.8	10.2	8.05	32.6	3.87	72.0	158.4	3.26	-	0.64

TABLE 6A

GROUP 5 - UNINJECTED SHAM THYMECTOMIZED ANIMALS - "WINTER"

Organ Weights in Milligrams

Rat No.	Body Wt.(g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
	Init.	Final									
32	61	163	149	74	166	37	1846	1532	27	520	5.7
33	68	169	130	84	119	36	1958	1478	33	379	7.2
34	61	132	94	37	59	22	1737	1230	25	395	5.8
35	57	148	103	52	68	23	1778	1360	25	245	7.0
36	65	143	170	86	153	39	1891	1428	34	425	5.7
37	58	132	67	52	43	20	1629	1071	28	270	5.7
38	52	108	56	49	34	13	1547	864	25	194	4.3
Mean	60	142	110	62	92	27	1769	1280	28	347	5.9
S.E.	1.99	7.81	15.8	7.21	20.3	3.81	54.8	91.2	1.45	43.3	0.36

TABLE 7A

GROUP 6 - UNINJECTED UNOPERATED ANIMALS - "WINTER"

Organ Weights in Milligrams

Rat No.	Body Wt.(g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
	Init.	Final									
54	60	129	69	48	Omit-mixed	1820	1094	30	292	6.0	
55	57	148	98	53	63	22	1782	1308	28	591	5.6
56	65	141	120	73	127	36	1832	1442	41	410	6.4
57	57	118	53	36	31	15	1610	972	26	201	4.2
58	51	109	42	31	26	12	1466	829	26	91	4.2
Mean	58	129	76	48	62	21	1702	1129	30	317	5.3
S.E.	2.28	7.14	14.4	7.37	23.2	5.35	71.2	110.9	2.80	86.3	0.46

TABLE 8A

GROUP 7 - SALINE INJECTED THYMECTOMIZED ANIMALS - "SUMMER"

Organ Weights in Milligrams

Rat No.	Body Wt.(g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
	Init.	Final									
62	71	157	154	79	86	22	1886	1425	34	-	-
63	88	186	159	101	188	60	2067	1694	29	-	7.7
64	59	133	88	42	58	11	1660	1055	26	-	5.4
65	75	193	114	88	205	52	1920	1835	33	-	8.0
66	71	161	73	65	120	32	1652	1357	29	-	-
67	91	214	184	125	218	51	2520	1933	40	-	9.6
68	73	171	159	93	221	52	2054	1489	30	-	7.2
69	69	170	116	87	120	30	2186	1498	35	-	7.7
70	79	232	177	110	243	47	2201	2205	42	-	-
Mean	75	180	136	88	162	40	2016	1610	33	-	7.6
S.E.	3.27	10.1	13.2	8.13	22.3	5.50	92.1	114.8	1.77	-	0.55

TABLE 9A

GROUP 8 - SALINE INJECTED SHAM THYMECTOMIZED ANIMALS - "SUMMER"

Organ Weights in Milligrams

Rat No.	Body Wt.(g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
	Init.	Final									
71	69	153	48	44	76	16	1242	1322	26	249	-
72	62	160	104	55	82	15	1692	1677	28	387	-
73	73	161	100	83	132	41	2564	1284	27	442	-
74	91	179	147	101	223	53	2270	1679	32	450	6.2
75	68	167	115	78	147	36	2321	1364	29	484	6.9
76	64	161	87	62	70	19	1887	1369	38	477	7.2
77	74	186	155	91	136	59	2040	1741	32	590	8.0
78	73	172	127	69	106	34	2004	1754	24	571	7.4
79	92	192	153	111	200	40	2315	1557	38	503	5.9
80	73	209	154	85	221	45	2260	1899	34	372	8.4
Mean	74	174	119	78	139	36	2060	1565	31	452	7.1
S.E.	3.20	5.52	11.2	6.57	18.5	4.80	120.6	68.4	1.53	31.5	0.34

TABLE 10A

GROUP 9 - SALINE INJECTED UNOPERATED ANIMALS - "SUMMER"

Organ Weights in Milligrams

Rat No.	Body Wt.(g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.	
	Init.	Final										
81	67	172	48	44	76	20	1450	1407	29	391	-	
82	69	154	140	86	114	30	2296	1523	35	442	-	
83	67	178	96	73	158	31	1945	1798	28	347	-	
84	69	125	98	64	76	37	1916	1232	29	348	-	
85	87	180	179	110	256	40	2365	1693	32	484	9.0	∞
86	60	157	68	63	88	14	1831	1502	26	562	7.4	
87	76	171	90	86	273	68	2251	1462	31	382	6.9	
88	74	188	163	100	167	50	2230	1823	30	634	8.7	
89	90	194	136	69	90	28	2038	1648	47	434	8.4	
90	75	182	154	88	174	53	2084	1650	28	494	8.8	
91	79	206	154	104	196	47	1988	1947	24	531	-	
Mean	74	173	120	81	152	38	2036	1608	31	459	8.2	
S.E.	2.69	6.63	12.8	6.04	21.1	4.74	78.2	62.5	1.84	27.7	0.35	

TABLE 11A

GROUP 10 - TESTOSTERONE INJECTED THYMECTOMIZED-GONADECTOMIZED ANIMALS - "SUMMER"

Rat No.	Body Wt. (g)		V.P.	DLP.	S.V. C.G.		Testes	Kidneys	Adr.	Thymus	Pit.
	Init.	Final									
92	75	170	45	66	68	21	-	1615	41	-	-
93	75	149	67	41	56	10	-	1464	lost	-	-
94	68	159	47	48	65	lost	-	1883	25	-	-
95	62	130	30	48	48	22	-	1328	30	-	-
96	70	184	176	103	233	46	-	1556	33	-	-
97	52	158	146	100	100	42	-	1385	31	-	-
98	64	156	90	79	89	20	-	1408	23	-	-
99	66	174	112	63	91	24	-	1554	38	-	-
100	77	180	58	71	79	19	-	1824	45	-	8.7
101	67	153	104	80	112	29	-	1493	31	-	5.1
102	98	107	158	115	223	60	-	1101	42	-	6.0
103	82	194	93	49	70	28	-	1657	42	-	9.6
104	70	170	117	73	106	46	-	1508	34	-	8.7

(Continued)

TABLE 11A - Continued

Organ Weights in Milligrams

Rat No.	Body Wt. (g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
	Init.	Final									
105	83	207	51	58	58	23	-	1861	44	-	9.8
106	85	204	44	43	57	15	-	2058	35	-	9.8
107	76	190	48	57	75	12	-	1885	38	-	9.7
108	63	176	108	59	62	21	-	1536	34	-	8.8
109	75	131	69	52	77	23	-	1348	34	-	6.5
110	66	164	55	59	78	21	-	1399	35	-	8.6
111	53	152	80	68	75	31	-	1451	33	-	6.9
Mean	71	165	85	67	91	27	-	1566	35	-	8.2
S.E.	2.44	5.64	9.26	4.56	11.1	2.96	-	52.5	1.37	-	0.47

TABLE 12A

GROUP 11 - TESTOSTERONE INJECTED SHAM THYMECTOMIZED-GONADECTOMIZED ANIMALS - "SUMMER"

Organ Weights in Milligrams

Rat No.	Body Wt.(g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
	Init.	Final									
112	75	174	58	38	60	22	-	1751	29	391	-
113	67	156	163	107	98	41	-	1309	32	340	-
114	68	165	158	93	230	48	-	1400	34	450	-
115	52	174	100	72	111	42	-	1538	32	496	-
116	65	159	83	49	83	28	-	1458	27	323	-
117	67	152	44	59	78	22	-	1409	30	560	-
118	65	163	82	64	90	30	-	1534	29	356	-
119	92	210	38	40	38	16	-	1929	35	989	11.2
120	96	204	99	88	101	22	-	1927	47	603	9.8
121	78	114	51	51	58	12	-	1143	25	204	6.0
122	73	160	42	47	50	16	-	1364	27	548	9.1
123	85	192	42	61	104	25	-	1789	42	454	8.7
124	76	197	45	56	71	22	-	2003	37	521	10.0

3

(Continued)

TABLE 12A - Continued

Organ Weights in Milligrams

Rat No.	Body Wt.(g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
	Init.	Final									
125	64	157	58	25	38	7.9	-	1457	40	522	8.4
126	76	183	64	69	95	24	-	1751	42	738	10.0
127	96	176	52	49	43	16	-	1584	40	629	9.1
128	66	153	49	62	55	16	-	1361	35	553	8.2
129	65	144	187	109	395	86	-	1531	27	277	6.2
130	66	182	212	122	206	50	-	1910	32	567	8.9
131	63	153	82	67	84	25	-	1317	33	459	6.6
132	54	174	69	81	90	33	-	1642	38	522	10.2
Mean	72	169	85	67	104	29	-	1576	34	500	8.7
S.E.	2.65	4.80	11.3	5.48	18.0	3.79	-	52.6	1.29	36.9	0.42

TABLE 13A

GROUP 12 - TESTOSTERONE INJECTED GONADECTOMIZED ANIMALS - "SUMMER"

Organ Weights in Milligrams

Rat No.	Body Wt.(g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
	Init.	Final									
133	76	170	44	45	60	20	-	1563	38	385	-
134	80	147	72	58	70	20	-	1528	30	352	-
135	57	152	97	75	192	26	-	1193	25	368	-
136	52	157	243	142	300	69	-	1325	30	339	-
137	64	170	74	44	62	17	-	1725	29	397	-
138	69	171	57	62	78	30	-	1595	25	395	-
139	64	141	109	82	137	39	-	1292	29	352	-
140	79	194	35	37	39	11	-	1890	33	690	10.1
141	93	208	116	86	112	37	-	1800	43	361	8.7
142	72	168	51	54	62	18	-	1341	31	561	6.2
143	85	220	58	64	72	24	-	2025	45	670	9.7
144	72	180	52	55	49	18	-	1589	32	586	8.2
145	68	198	45	52	61	20	-	2047	48	512	8.7

(Continued)

TABLE 13A - Continued

Organ Weights in Milligrams

Rat No.	Body Wt.(g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
	Init.	Final									
146	63	177	50	30	40	10	-	1675	47	605	10.2
147	59	160	52	25	26	12	-	1409	30	654	9.3
148	76	178	116	74	73	20	-	1697	34	818	10.5
149	62	170	39	45	33	13	-	1684	37	698	9.9
150	69	178	58	57	59	16	-	1659	48	716	8.3
151	66	126	107	62	80	35	-	1150	24	327	5.8
152	64	168	125	79	86	32	-	1502	24	508	8.1
153	61	167	70	55	51	23	-	1409	29	509	9.1
154	54	154	63	55	65	29	-	1390	28	377	8.2
155	66	178	172	103	137	59	-	1756	37	488	9.3
Mean	68	171	83	63	84	26	-	1576	34	507	8.8
S.E.	2.06	4.40	10.2	5.25	12.6	3.04	-	50.6	1.62	30.9	0.33

TABLE 14A

GROUP 13 - CORTISONE ACETATE INJECTED THYMECTOMIZED-ADRENALECTOMIZED ANIMALS - "SUMMER"

Organ Weights in Milligrams

Rat No.	Body Wt. (g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
	Init.	Final									
156	80	141	107	80	122	26	2283	1284	-	-	6.0
157	80	194	157	125	326	54	2489	2195	-	-	8.2
158	77	143	104	90	186	36	2032	1379	-	-	4.4
159	74	211	109	74	146	27	2077	2427	-	-	9.4
160	95	199	241	159	404	54	2311	1998	-	-	10.8
161	82	167	174	134	271	51	2456	1618	-	-	7.1
162	102	184	159	88	227	48	2275	1558	-	-	8.6
163	74	118	75	39	30	12	1659	1011	-	-	4.4
164	90	218	141	119	239	38	2128	2376	-	-	10.0
165	84	151	111	95	159	52	2123	1299	-	-	7.6
166	73	156	111	104	204	53	2066	1307	-	-	7.4
167	68	123	99	65	108	25	1784	1043	-	-	7.1
168	75	149	159	104	175	45	2018	1470	-	-	6.8

(Continued)

TABLE 14A - Continued

Organ Weights in Milligrams

Rat No.	Body Wt. (g) Init.-Final		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
169	70	142	87	78	168	28	1845	1469	-	-	6.2
170	102	155	132	92	161	44	2109	1448	-	-	7.8
Mean	82	163	131	96	195	40	2110	1592	-	-	7.4
S.E.	2.82	8.00	10.9	7.65	23.5	3.43	60.2	116.3	-	-	0.47

TABLE 15A

GROUP 14 - CORTISONE ACETATE INJECTED SHAM THYMECTOMIZED-
ADRENALECTOMIZED ANIMALS - "SUMMER"

Organ Weights in Milligrams

Rat No.	Body Wt.(g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
	Init.	Final									
171	82	188	115	75	156	45	2105	1802	-	715	8.8
172	78	153	114	89	213	42	2043	1397	-	392	6.9
173	72	180	127	90	116	37	1858	1738	-	538	10.3
174	65	119	89	45	69	22	1341	1127	-	484	4.9
175	79	143	111	68	90	23	1614	1448	-	392	7.8
176	75	151	102	53	96	18	1765	1492	-	549	6.9
177	86	148	156	97	191	50	2583	1272	-	538	4.6
178	84	150	160	105	224	59	2154	1425	-	525	7.1
179	92	185	150	75	161	39	2202	1755	-	642	8.0
180	94	233	171	133	306	59	2357	2091	-	553	9.8
181	61	117	116	72	135	36	1931	1146	-	420	5.4

(Continued)

TABLE 15A - Continued

Rat No.	Body Wt.(g)		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
	Init.-	Final									
182	94	221	180	143	280	71	2686	1900	-	525	8.4
Mean	80	166	133	87	170	42	2053	1549	-	523	7.4
S.E.	3.10	10.5	8.52	8.48	21.7	4.69	111.6	88.3	-	27.5	0.52

TABLE 16A

GROUP 15 - CORTISONE ACETATE INJECTED ADRENALECTOMIZED ANIMALS - "SUMMER"

Organ Weights in Milligrams

Rat No.	Body Wt.(g) Init.-Final		V.P.	DLP.	S.V.	C.G.	Testes	Kidneys	Adr.	Thymus	Pit.
183	75	137	101	88	162	28	2092	1348	-	533	5.4
184	79	152	140	106	122	34	2016	1344	-	591	5.3
185	76	146	96	107	230	55	2064	1419	-	645	-
186	77	156	142	87	183	37	1943	1467	-	415	5.4
187	75	137	100	75	97	32	1913	1332	-	465	6.9
188	66	132	104	67	136	33	1910	1400	-	612	2.6
189	81	151	188	100	232	48	2307	1422	-	500	6.3
190	80	137	146	89	193	31	2306	1011	-	460	7.2
191	87	197	141	112	257	53	2191	1707	-	483	9.5
192	72	132	96	91	168	39	1775	1210	-	543	3.8
193	73	143	156	82	160	35	2269	1218	-	625	5.8
194	60	99	108	58	100	23	1567	1080	-	388	5.0
Mean	75	143	126	88	170	37	2029	1330	-	497	5.7
S.E.	2.03	6.47	8.58	4.73	15.0	2.85	64.9	53.2	-	24.3	0.54

TABLE 17A

GROUP 1 - UNINJECTED THYMECTOMIZED ANIMALS - "SUMMER"
 VENTRAL PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units* per Gram	Units* per Organ	Units* per Gram	Units* per Organ
1	0.66	0.100	2.48	0.374
2		0.083		0.312
3	0.65	0.13	2.04	0.413
4		0.078		0.248
6	0.68	0.101	2.19	0.322
7	0.58	0.088	2.50	0.380
8	0.60	0.095	1.40	0.220
9	0.54	0.064	2.18	0.257
10	0.54	0.097	2.06	0.364
16	0.66	0.082	1.56	0.192
17	0.61	0.099	2.02	0.328
18	0.74	0.116	1.62	0.253
19	0.57	0.069	2.83	0.340
Mean	0.62	0.092	2.08	0.308
S.E.	0.019	0.005	0.13	0.019

Each value represents an average of two determinations.

*Unit - equivalent to the liberation of one milligram
of inorganic phosphate per milligram of tissue
during a one hour incubation at 37° C.

TABLE 18A

GROUP 2 - UNINJECTED SHAM THYMECTOMIZED ANIMALS - "SUMMER"
 VENTRAL PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
20	0.52	0.061	2.80	0.340
21	0.70	0.094	2.88	0.389
22	0.78	0.077	2.72	0.268
23	0.49	0.040	1.45	0.114
24	0.68	0.068	1.84	0.182
26	0.74	0.100	1.26	0.174
27	0.54	0.056	2.44	0.254
28	0.57	0.092	1.72	0.276
29	0.58	0.042	2.14	0.156
30		0.063		0.232
31	0.56	0.076	1.95	0.264
39	0.78	0.130	2.38	0.393
40	0.67	0.081	1.66	0.201
41	0.61	0.084	2.01	0.275
Mean	0.63	0.076	2.10	0.251
S.E.	0.027	0.006	0.14	0.022

TABLE 19A

GROUP 3 - UNINJECTED UNOPERATED ANIMALS - "SUMMER"
 VENTRAL PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
42	0.74	0.074	4.39	0.439
43	0.66	0.056	3.55	0.298
44	0.48	0.052	2.59	0.284
45	0.62	0.044	1.55	0.110
46	0.58	0.074	1.14	0.149
47	0.65	0.061	1.55	0.146
48	0.36	0.049	0.74	0.102
49	0.80	0.075	1.10	0.100
50	0.70	0.140	2.30	0.463
52	0.35	0.036	1.88	0.191
53	0.52	0.078	2.20	0.330
59	0.64	0.062	3.40	0.330
60	0.82	0.120	2.30	0.322
61	0.77	0.092	3.60	0.431
Mean	0.62	0.072	2.31	0.264
S.E.	0.04	0.008	0.29	0.035

TABLE 20A

GROUP 4 - UNINJECTED THYMECTOMIZED ANIMALS - "WINTER"
 VENTRAL PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
11	0.66	0.066	1.55	0.154
12		0.072		0.167
13	0.26	0.024	1.16	0.104
15		0.018		0.080
14	0.28	0.037	1.52	0.200
Mean	0.40	0.043	1.41	0.141
S.E.	0.13	0.011	0.12	0.022

TABLE 21A

GROUP 5 - UNINJECTED SHAM THYMECTOMIZED ANIMALS - "WINTER"
 VENTRAL PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
32	0.66	0.098	2.39	0.357
33	0.48	0.062	1.20	0.156
34	0.20	0.018	1.66	0.156
37		0.013		0.112
38		0.011		0.094
35	0.40	0.041	1.80	0.186
36	0.38	0.064	0.73	0.120
Mean	0.42	0.044	1.56	0.169
S.E.	0.075	0.012	0.28	0.034

TABLE 22A

GROUP 6 - UNINJECTED UNOPERATED ANIMALS - "WINTER"
 VENTRAL PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
55	0.50	0.048	1.90	0.186
56	0.42	0.050	1.16	0.138
57	0.75	0.040	2.60	0.138
58		0.032		0.110
Mean	0.56	0.042	1.89	0.143
S.E.	0.099	0.0041	0.42	0.016

TABLE 23A

GROUP 7 - SALINE INJECTED THYMECTOMIZED ANIMALS - "SUMMER"
 VENTRAL PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
62	0.64	0.100	1.85	0.286
63	0.83	0.130	2.55	0.406
64	0.80	0.070	1.01	0.088
65	0.66	0.075	2.46	0.280
67	0.80	0.150	1.44	0.265
68	0.65	0.104	2.66	0.423
69	0.59	0.069	3.44	0.398
70	0.56	0.098	2.59	0.458
Mean	0.69	0.100	2.25	0.326
S.E.	0.037	0.010	0.27	0.043

TABLE 24A

GROUP 8-SALINE INJECTED SHAM THYMECTOMIZED ANIMALS-"SUMMER"
 VENTRAL PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
72	0.58	0.060	2.54	0.264
73	0.96	0.096	3.88	0.388
74	0.93	0.140	2.86	0.421
75	1.17	0.130	2.92	0.337
76	0.73	0.063	1.50	0.130
77	0.71	0.110	2.74	0.426
78	0.84	0.110	2.10	0.268
79	0.70	0.110	2.73	0.418
80	0.82	0.130	2.87	0.442
Mean	0.83	0.105	2.68	0.344
S.E.	0.058	0.0094	0.21	0.035

TABLE 25A

GROUP 9 - SALINE INJECTED UNOPERATED ANIMALS - "SUMMER"
 VENTRAL PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
82	0.64	0.090	1.50	0.210
83	0.74	0.070	2.68	0.258
84	0.92	0.090	5.20	0.520
85	0.54	0.097	2.11	0.378
87	0.64	0.058	1.86	0.168
88	0.71	0.120	1.90	0.310
89	0.64	0.087	3.07	0.418
90	0.72	0.110	2.23	0.344
91	0.66	0.100	2.86	0.442
Mean	0.69	0.091	2.60	0.339
S.E.	0.035	0.0063	0.37	0.038

TABLE 26A

GROUP 10 - TESTOSTERONE INJECTED THYMECTOMIZED -
GONADECTOMIZED ANIMALS - "SUMMER" - VENTRAL
PROSTATE GLAND - ACID AND ALKALINE
PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
92	0.80	0.036	2.49	0.112
93		0.054		0.167
94	1.18	0.056	2.46	0.116
95		0.036		0.074
96	0.46	0.082	1.96	0.344
97	0.71	0.105	3.80	0.554
98	0.72	0.064	2.05	0.184
99	0.49	0.055	0.74	0.082
100	0.64	0.036	2.30	0.133
105		0.032		0.116
101	0.83	0.086	2.20	0.228
102	0.45	0.072	3.10	0.490
103	0.75	0.070	3.91	0.365
104	0.70	0.082	2.54	0.298
106	1.17	0.051	2.52	0.111
107		0.056		0.120
108	0.42	0.045	2.40	0.260
109	0.63	0.043	3.96	0.272
110	0.56	0.031	3.94	0.218
111	0.57	0.046	3.92	0.312
Mean	0.69	0.057	2.77	0.228
S.E.	0.057	0.0046	0.23	0.030

TABLE 27A

GROUP 11 - TESTOSTERONE INJECTED SHAM THYMECTOMIZED -
 GONADECTOMIZED ANIMALS - "SUMMER"
 VENTRAL PROSTATE GLAND - ACID
 AND ALKALINE PHOSPHATASE
 ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
113	0.51	0.083	2.66	0.434
114	0.66	0.104	2.92	0.462
115	0.66	0.066	2.98	0.298
116	0.98	0.082	2.86	0.232
117	0.90	0.040	2.08	0.092
118		0.074		0.170
119	0.54	0.021	2.44	0.094
121		0.028		0.126
120	0.68	0.068	1.36	0.134
122	0.76	0.032	2.42	0.102
123		0.032		0.101
124		0.034		0.110
125	0.47	0.028	2.20	0.128
127		0.025		0.114
126	0.62	0.040	2.68	0.173
128		0.030		0.132
129	0.75	0.140	2.00	0.374
130	0.56	0.120	2.20	0.467
131	0.53	0.044	2.48	0.204
132	0.66	0.046	5.16	0.356
Mean	0.66	0.057	2.60	0.215
S.E.	0.039	0.0076	0.23	0.030

TABLE 28A

GROUP 12 - TESTOSTERONE INJECTED GONAECTOMIZED
 ANIMALS - "SUMMER" - VENTRAL PROSTATE
 GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
133	0.86	0.038	4.44	0.196
134		0.062		0.320
135	0.86	0.083	2.58	0.250
136	0.38	0.090	2.50	0.608
137	0.99	0.073	2.50	0.186
138	1.00	0.057	1.78	0.101
139		0.110		0.194
140	0.83	0.029	3.47	0.121
142		0.042		0.177
143		0.048		0.201
141	0.50	0.058	3.04	0.353
144	0.87	0.044	2.86	0.147
145		0.040		0.129
146	0.53	0.027	2.19	0.110
147		0.028		0.114
148	0.55	0.064	2.88	0.335
149	0.53	0.020	2.80	0.108
150		0.031		0.162
151	0.63	0.068	3.30	0.352
152	0.59	0.074	2.52	0.314
153	0.52	0.036	3.64	0.254
154		0.032		0.228
155	0.58	0.100	3.24	0.556
Mean	0.68	0.054	2.92	0.240
S.E.	0.051	0.0052	0.17	0.028

TABLE 29A

GROUP 13 - CORTISONE ACETATE INJECTED THYMECTOMIZED -
 ADRENALECTOMIZED ANIMALS - "SUMMER"
 VENTRAL PROSTATE GLAND - ACID
 AND ALKALINE PHOSPHATASE
 ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
156	0.62	0.066	1.28	0.137
158		0.064		0.133
157	0.79	0.120	2.74	0.430
159	0.51	0.056	3.47	0.378
160	0.74	0.180	1.42	0.340
161	0.68	0.120	2.66	0.462
162	0.59	0.094	1.30	0.208
163	0.78	0.058	1.37	0.102
164	0.61	0.086	2.08	0.293
165	0.47	0.052	1.01	0.112
166	0.72	0.079	4.08	0.452
167	0.52	0.051	3.16	0.312
168	0.62	0.098	1.46	0.232
169	0.91	0.080	3.72	0.325
170	0.54	0.070	3.04	0.401
Mean	0.65	0.085	2.34	0.288
S.E.	0.034	0.0089	0.28	0.033

TABLE 30A

GROUP 14 - CORTISONE ACETATE INJECTED SHAM THYMECTOMIZED -
 ADRENALECTOMIZED ANIMALS - "SUMMER"
 VENTRAL PROSTATE GLAND - ACID
 AND ALKALINE PHOSPHATASE
 ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
171	0.35	0.040	1.22	0.140
172		0.040		0.140
173	0.55	0.070	2.18	0.278
174	0.75	0.066	3.66	0.325
175	0.41	0.045	2.61	0.289
176	0.50	0.051	3.10	0.316
177	0.86	0.140	2.38	0.372
178	0.42	0.066	1.31	0.210
179	0.59	0.088	2.14	0.320
180	0.44	0.076	2.47	0.422
181	0.70	0.081	2.49	0.289
182	0.71	0.120	2.02	0.362
Mean	0.57	0.074	2.32	0.289
S.E.	0.050	0.0089	0.21	0.025

TABLE 31A

GROUP 15 - CORTISONE ACETATE INJECTED
 ADRENALECTOMIZED ANIMALS - "SUMMER"
 VENTRAL PROSTATE GLAND - ACID
 AND ALKALINE PHOSPHATASE
 ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
183	0.66	0.066	1.90	0.192
185		0.064		0.182
184	0.80	0.110	3.85	0.537
186	0.48	0.068	2.20	0.311
187	0.50	0.050	2.30	0.231
189	0.64	0.120	1.62	0.304
190	0.78	0.110	1.26	0.184
191	0.54	0.075	2.70	0.380
192	0.80	0.076	4.63	0.444
193	0.58	0.090	2.14	0.335
194	0.74	0.081	1.64	0.178
Mean	0.65	0.083	2.42	0.298
S.E.	0.039	0.0067	0.33	0.036

TABLE 32A

GROUP 1 - UNINJECTED THYMECTOMIZED ANIMALS - "SUMMER"
 DORSOLATERAL PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
7	0.18	0.018	0.34	0.034
8	0.34	0.036	0.70	0.074
9	0.46	0.036	1.00	0.081
10	0.34	0.040	0.96	0.124
16	0.28	0.013	0.50	0.022
19		0.025		0.045
17	0.32	0.030	0.59	0.056
18	0.36	0.034	0.50	0.049
Mean	0.33	0.029	0.66	0.061
S.E.	0.032	0.0034	0.093	0.011

TABLE 33A

GROUP 2 - UNINJECTED SHAM THYMECTOMIZED ANIMALS - "SUMMER"
 DORSOLATERAL PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
27	0.31	0.026	0.65	0.054
28	0.37	0.040	0.81	0.088
29	0.58	0.022	1.34	0.050
30		0.031		0.072
31	0.36	0.026	1.36	0.100
39	0.32	0.022	0.57	0.038
40	0.42	0.036	0.56	0.049
41	0.36	0.028	0.68	0.052
Mean	0.39	0.029	0.85	0.063
S.E.	0.034	0.0023	0.13	0.0078

TABLE 34A

GROUP 3 - UNINJECTED UNOPERATED ANIMALS - "SUMMER"
 DORSOLATERAL PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
46	0.28	0.027	0.54	0.052
49	0.54	0.040	1.05	0.078
50	0.40	0.044	0.90	0.096
51	0.49	0.024	1.16	0.055
52		0.024		0.058
53	0.34	0.037	0.70	0.076
59	0.28	0.010	0.42	0.016
61		0.024		0.035
Mean	0.39	0.029	0.80	0.058
S.E.	0.044	0.0039	0.12	0.0090

TABLE 35A

GROUP 4 - UNINJECTED THYMECTOMIZED ANIMALS - "WINTER"
 DORSOLATERAL PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
11	0.41	0.026	0.88	0.055
12		0.034		0.074
13	0.30	0.016	0.74	0.041
14		0.018		0.047
15		0.010		0.025
Mean	0.36	0.021	0.81	0.048
S.E.	0.055	0.0042	0.070	0.0081

TABLE 36A

GROUP 5 - UNINJECTED SHAM THYMECTOMIZED ANIMALS - "WINTER"
 DORSOLATERAL PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
32	0.40	0.029	0.77	0.057
33	0.30	0.025	1.08	0.091
34	0.14	0.0053	0.82	0.030
35		0.0074		0.042
36	0.32	0.026	1.02	0.087
37	0.44	0.023	0.82	0.042
38		0.022		0.040
Mean	0.32	0.020	0.90	0.056
S.E.	0.052	0.0035	0.062	0.0091

TABLE 37A

GROUP 6 - UNINJECTED UNOPERATED ANIMALS - "WINTER"
 DORSOLATERAL PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
56	0.29	0.021	0.84	0.061
57	0.42	0.015	0.84	0.030
58		0.013		0.026
Mean	0.36	0.016	0.84	0.039
S.E.	0.065	0.0024	0.0000	0.011

TABLE 38A

GROUP 7 - SALINE INJECTED THYMECTOMIZED ANIMALS - "SUMMER"
 DORSOLATERAL PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
62	0.35	0.027	0.94	0.074
64		0.015		0.040
63	0.47	0.048	0.92	0.093
65	0.32	0.028	1.36	0.120
67	0.30	0.038	0.78	0.098
68	0.23	0.022	0.88	0.082
69	0.28	0.024	0.63	0.056
70	0.21	0.023	0.50	0.056
Mean	0.31	0.028	0.86	0.077
S.E.	0.033	0.0036	0.10	0.0093

TABLE 39A

GROUP 8-SALINE INJECTED SHAM THYMECTOMIZED ANIMALS-"SUMMER"
 DORSOLATERAL PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
72	0.42	0.023	1.01	0.055
76		0.026		0.062
73	0.36	0.030	0.63	0.053
74	0.47	0.048	1.50	0.152
75	0.25	0.020	0.50	0.039
77	0.27	0.025	0.94	0.084
78	0.28	0.019	0.77	0.054
79	0.22	0.025	0.60	0.067
80	0.26	0.022	0.64	0.054
Mean	0.32	0.026	0.82	0.069
S.E.	0.032	0.0029	0.11	0.011

TABLE 40A

GROUP 9 - SALINE INJECTED UNOPERATED ANIMALS - "SUMMER"
 DORSOLATERAL PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
81	0.47	0.017	0.82	0.029
84		0.030		0.052
82	0.31	0.026	0.84	0.072
83	0.36	0.026	0.59	0.042
85	0.34	0.038	0.84	0.093
87	0.24	0.021	0.65	0.056
88	0.27	0.027	0.90	0.090
89	0.14	0.0094	0.50	0.036
90	0.27*	0.024	0.58	0.051
91	0.24	0.025	0.63	0.065
Mean	0.29	0.024	0.71	0.059
S.E.	0.031	0.0024	0.048	0.0068

*Single determination

TABLE 41A

GROUP 10 - TESTOSTERONE INJECTED THYMECTOMIZED -
 GONADECTOMIZED ANIMALS - "SUMMER"
 DORSOLATERAL PROSTATE GLAND -
 ACID AND ALKALINE
 PHOSPHATASE
 ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
100	0.41	0.029	0.66	0.047
101	0.46	0.038	0.66	0.052
102	0.43	0.049	1.11	0.128
103	0.54	0.026	0.90	0.044
105		0.032		0.052
104	0.31	0.022	0.46	0.034
106	0.34	0.014	0.56	0.024
107		0.020		0.032
108	0.44	0.026	0.48	0.028
109	0.48	0.024	0.66	0.034
110	0.48	0.028	0.62	0.036
111	0.56	0.038	0.62	0.042
Mean	0.44	0.029	0.67	0.046
S.E.	0.025	0.0027	0.062	0.0079

TABLE 42A

GROUP 11 - TESTOSTERONE INJECTED SHAM THYMECTOMIZED -
 GONADECTOMIZED ANIMALS - "SUMMER" - DORSOLATERAL
 PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
119	0.46	0.018	0.60	0.024
121		0.024		0.031
120	0.34	0.030	0.24	0.022
122	0.34	0.016	0.64	0.030
124		0.020		0.035
123	0.36	0.022	0.60	0.036
125	0.43	0.011	0.60	0.015
127		0.021		0.030
126	0.44	0.030	0.72	0.050
128	0.38	0.024	0.34	0.021
129	0.48	0.052	1.12	0.122
130	0.40	0.050	0.68	0.084
131	0.37	0.025	0.46	0.030
132	0.47	0.038	0.44	0.036
Mean	0.41	0.027	0.58	0.040
S.E.	0.016	0.0032	0.070	0.0077

TABLE 43A

GROUP 12 - TESTOSTERONE INJECTED GONADECTOMIZED ANIMALS -
 "SUMMER" - DORSOLATERAL PROSTATE GLAND - ACID AND
 ALKALINE PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
140	0.51	0.019	0.47	0.018
142		0.028		0.025
141	0.52	0.044	0.64	0.054
143	0.48	0.030	0.77	0.050
144	0.50	0.028	0.92	0.050
145		0.026		0.047
146	0.34	0.010	0.31	0.0092
149		0.015		0.014
147	0.46	0.011	0.36	0.0089
150		0.026		0.020
148	0.39	0.029	0.44	0.033
151	0.48	0.030	0.64	0.040
152	0.40	0.032	0.50	0.040
153	0.39	0.021	0.51	0.028
154		0.022		0.028
155	0.52	0.054	0.78	0.080
Mean	0.45	0.027	0.58	0.034
S.E.	0.019	0.0028	0.057	0.0048

TABLE 44A

GROUP 13 - CORTISONE ACETATE INJECTED THYMECTOMIZED -
 ADRENALECTOMIZED ANIMALS - "SUMMER" - DORSOLATERAL
 PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
156	0.32	0.026	0.56	0.046
157	0.45	0.056	1.06	0.134
158	0.38	0.034	0.88	0.078
159	0.36	0.027	1.08	0.080
160	0.35	0.056	1.04	0.166
161	0.34	0.046	1.10	0.148
162	0.36	0.032	0.78	0.069
163	0.38	0.015	0.92	0.036
167		0.025		0.060
164	0.30	0.036	0.76	0.091
165	0.32	0.030	1.04	0.098
166	0.32	0.033	1.54	0.159
168	0.28	0.029	0.93	0.097
169	0.26	0.020	1.20	0.094
170	0.26	0.024	0.73	0.067
Mean	0.33	0.033	0.97	0.095
S.E.	0.014	0.0031	0.064	0.010

TABLE 45A

GROUP 14 - CORTISONE ACETATE INJECTED SHAM THYMECTOMIZED -
 ADRENALECTOMIZED ANIMALS - "SUMMER" - DORSOLATERAL
 PROSTATE GLAND - ACID AND ALKALINE
 PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
171	0.34	0.026	1.06	0.078
172	0.34	0.030	0.73	0.065
173	0.28	0.025	1.15*	0.103
174	0.38	0.018	0.84	0.038
176		0.020		0.044
175	0.30	0.020	0.86	0.059
181		0.022		0.063
177	0.31	0.030	0.78	0.076
178	0.24	0.026	0.55	0.058
179	0.32	0.024	0.83	0.063
180	0.30	0.040	0.90	0.120
182	0.20	0.029	0.18	0.025
Mean	0.30	0.026	0.79	0.066
S.E.	0.016	0.0017	0.085	0.0076

*Single Determination.

TABLE 46A

GROUP 15 - CORTISONE ACETATE INJECTED ADRENALECTOMIZED
ANIMALS - "SUMMER" - DORSOLATERAL PROSTATE GLAND -
ACID AND ALKALINE PHOSPHATASE ACTIVITIES

Rat No. of Tissue Donors	ACID PHOSPHATASE		ALKALINE PHOSPHATASE	
	Units per Gram	Units per Organ	Units per Gram	Units per Organ
183	0.31	0.027	0.69	0.061
184	0.42	0.046	1.12	0.119
185	0.40	0.043	1.18	0.127
186	0.35	0.030	0.77*	0.067
187	0.42	0.032	1.04	0.078
194		0.024		0.061
189	0.48	0.048	1.30	0.130
190	0.28	0.024	0.88	0.079
191	0.26	0.030	0.88	0.099
192	0.30	0.028	1.34	0.122
193	0.27	0.022	1.04	0.086
Mean	0.35	0.032	1.02	0.094
S.E.	0.024	0.0028	0.069	0.0081

*Single Determination.

TABLE 47A

UNINJECTED THYMECTOMIZED ANIMALS - ALL SEASONS
VENTRAL PROSTATE GLAND - CITRIC ACID

Animal No.*	V.P. Wt. (mg.)	CITRIC ACID	
		ug./mg. V.P.	ug./organ
1	151	0.38	57.
2	126		48.
3	203		77.
4	122		46.
6	147		56.
-	137		0.78
7	156	122.	
8	158	124.	
-	117	92.	
9	118	92.	
10	177	139.	
11	98	0.26	26.
-	193		51.
12	108		28.
14	131	0.74	98.
16	123		92.
19	120		90.
17	163	0.74	120.
18	156		116.
Mean		0.58	83.
S.E.		0.11	7.88
n		5	19

NOTE: *Some of the animals whose organs were used in the citric acid determinations were not reported in the dissertation for a variety of reasons. Therefore, certain animals are not represented by numbers. Since organ weights of these animals are not contained in the data tables, ventral prostate gland weights of all animals are recorded in the citric acid data tables.

Since seasonal variations were not predicted, no attempt was made to separate the organs of summer and winter animals. Therefore the citric acid data, in some cases, represents animals of all seasons.

TABLE 48A

UNINJECTED SHAM THYMECTOMIZED ANIMALS - ALL SEASONS
VENTRAL PROSTATE GLAND - CITRIC ACID

Animal No.	V.P. Wt. (mg)	CITRIC ACID	
		ug./mg. V.P.	ug./organ
20	118	0.30	36.
21	135		41.
22	99		30.
-	129		39.
23	80		24.
25	150		0.51
26	138	70.	
27	105	52.	
28	161	82.	
-	95	48.	
-	115	58.	
29	72	0.40	
30	108		42.
31	136		54.
32	149		59.
-	218		86.
34	94		0.28
35	103	29.	
37	67	19.	
33	130	36.	
36	170	0.40	
38	56		22.
40	121		49.
39	165		0.79
41	137	108.	
Mean		0.45	52.
S.E.		0.077	5.56
n		6	25

TABLE 49A

UNINJECTED UNOPERATED ANIMALS - ALL SEASONS
VENTRAL PROSTATE GLAND - CITRIC ACID

Animal No.	V.P. Wt. (mg)	CITRIC ACID	
		ug./mg. V.P.	ug./organ
42	100	0.48	48.
43	84		40.
44	110		53.
-	114		55.
46	130		62.
49	94		45.
50	202		97.
53	150	0.28	43.
-	150		43.
55	98		28.
56	120		34.
57	53		15.
58	42		12.
59	97		0.66
60	140	93.	
61	120	80.	
Mean		0.47	51.
S.E.		0.11	6.10
n		3	16

TABLE 50A

SALINE INJECTED THYMECTOMIZED ANIMALS - ALL SEASONS
 VENTRAL PROSTATE GLAND - CITRIC ACID

Animal No.	V.P. Wt. (mg)	CITRIC ACID	
		ug./mg. V.P.	ug./organ
-	148	0.22	33.
-	193		42.
-	101	0.26	26.
62	154		40.
66	73		19.
63	159	0.58	92.
68	159		92.
64	88		21.
65	114		27.
69	116		28.
67	184		18.
70	177		17.
Mean			38.
S.E.			7.66
n			12

TABLE 50A

SALINE INJECTED THYMECTOMIZED ANIMALS - ALL SEASONS
 VENTRAL PROSTATE GLAND - CITRIC ACID

Animal No.	V.P. Wt. (mg)	CITRIC ACID	
		ug./mg. V.P.	ug./organ
-	148	0.22	33.
-	193		42.
-	101	0.26	26.
62	154		40.
66	73		19.
63	159	0.58	92.
68	159		92.
64	88	0.24	21.
65	114		27.
69	116		28.
67	184	0.10	18.
70	177		17.
Mean		0.28	38.
S.E.		0.080	7.66
n		5	12

TABLE 51A

SALINE INJECTED SHAM THYMECTOMIZED ANIMALS - ALL SEASONS
 VENTRAL PROSTATE GLAND - CITRIC ACID

Animal No.	V.P. Wt. (mg)	CITRIC ACID	
		ug./mg. V.P.	ug./organ
-	139	0.28	38.
-	185		50.
-	69	0.31	22.
71	48		15.
72	104		32.
73	100		31.
74	147	0.16	24.
75	115		18.
76	87		14.
77	155	0.42	66.
78	127		54.
79	153	0.84	130.
80	154		130.
Mean		0.40	48.
S.E.		0.12	11.0
n		5	13

TABLE 52A

SALINE INJECTED UNOPERATED ANIMALS - ALL SEASONS
 VENTRAL PROSTATE GLAND - CITRIC ACID

Animal No.	V.P. Wt. (mg)	CITRIC ACID	
		ug./mg. V.P.	ug./organ
82	140	0.36	50.
83	96		34.
84	98		34.
88	163	0.58	94.
89	136		78.
90	154	0.04	6.9
91	154		6.9
81	48	0.46	22.
85	179		82.
87	90		42.
Mean		0.36	45.
S.E.		0.12	9.87
n		4	10

TABLE 53A

TESTOSTERONE INJECTED THYMECTOMIZED - GONADECTOMIZED
 ANIMALS - "SUMMER" (GROUP 10)
 VENTRAL PROSTATE GLAND -
 CITRIC ACID

Animal No.	V.P. Wt. (mg)	CITRIC ACID	
		ug./mg. V.P.	ug./organ
92	45	0.49	22.
93	67		33.
94	47		23.
95	30		15.
98	90		44.
96	176	0.20	35.
97	146		30.
99	112		22.
100	58	0.36	21.
101	104		38.
102	158		58.
103	93	0.55	51.
104	117		64.
105	51		28.
106	44		24.
107	48	0.98	47.
108	108		106.
109	69		68.
110	55		54.
111	80		78.
Mean		0.52	43.
S.E.		0.13	5.16
n		5	20

TABLE 54A

TESTOSTERONE INJECTED SHAM THYMECTOMIZED - GONADECTOMIZED
 ANIMALS - "SUMMER" (GROUP 11)
 VENTRAL PROSTATE GLAND -
 CITRIC ACID

Animal No.	V.P. Wt. (mg)	CITRIC ACID	
		ug./mg. V.P.	ug./organ
114	158	0.32	50.
115	100		32.
117	44		14.
113	163	0.68	112.
116	83		57.
118	82		56.
119	38	0.29	11.
120	99		29.
121	51		14.
122	42		12.
123	42		12.
124	45		14.
125	58		16.
126	64	0.40	26.
130	212		85.
127	52	0.63	32.
128	49		30.
129	187		118.
Mean		0.46	40.
S.E.		0.080	8.00
n		5	18

TABLE 55A

TESTOSTERONE INJECTED GONADECTOMIZED ANIMALS -
 "SUMMER" (GROUP 12) - VENTRAL PROSTATE
 GLAND - CITRIC ACID

Animal No.	V.P. Wt. (mg)	CITRIC ACID	
		ug./mg. V.P.	ug./organ
133	44	0.34	15.
134	72		25.
138	57		20.
139	109		38.
141	116	0.43	50.
143	58		25.
144	52		22.
145	45		19.
146	50		22.
147	52	0.95	50.
148	116		110.
149	39		37.
151	107		102.
150	58	0.88	49.
155	172		146.
152	125	0.56	70.
153	70		40.
154	63		36.
Mean		0.63	49.
S.E.		0.12	8.56
n		5	18

TABLE 56A

CORTISONE ACETATE INJECTED THYMECTOMIZED -
ADRENALECTOMIZED ANIMALS - "SUMMER"
(GROUP 13) - VENTRAL PROSTATE
GLAND - CITRIC ACID

Animal No.	V.P. Wt. (mg)	CITRIC ACID	
		ug./mg. V.P.	ug./organ
158	104	0.20	21.
161	174		34.
159	109	0.44	48.
162	159		71.
169	87		38.
165	111	0.09	9.6
166	111		9.6
167	99		8.6
168	159	0.24	38.
170	132		32.
164	141		34.
Mean		0.24	31.
S.E.		0.073	5.6
n		4	11

NOTE: The following samples contained too little citric acid to be detected by the method employed, in spite of the fact that they contained goodly amounts of tissue. Since this problem occurred only in animals without adrenals receiving cortisone acetate it was deemed worthy of mention.

160	241	-	-
156	107	-	-
157	157	-	-

TABLE 57A

CORTISONE ACETATE INJECTED SHAM THYMECTOMIZED -
ADRENALECTOMIZED ANIMALS - "SUMMER" (GROUP 14)
VENTRAL PROSTATE GLAND - CITRIC ACID

Animal No.	V.P. Wt. (mg)	CITRIC ACID	
		ug./mg. V.P.	ug./organ
172	114	0.26	29.
178	160		41.
175	111	0.21	24.
177	156		33.
174	89	0.22	20.
180	171		38.
182	180		40.
176	102	0.23	23.
179	150		34.
181	116		27.
Mean		0.23	31.
S.E.		0.009	2.35
n		4	10

NOTE: The following samples contained too little citric acid to be detected by the method employed, in spite of the fact that they contained goodly amounts of tissue. Since this problem occurred only in animals without adrenals receiving cortisone acetate it was deemed worthy of mention.

171	115	-	-
173	127	-	-

TABLE 58A

CORTISONE ACETATE INJECTED ADRENALECTOMIZED
ANIMALS - "SUMMER" (GROUP 15)
VENTRAL PROSTATE GLAND -
CITRIC ACID

Animal No.	V.P. Wt. (mg)	CITRIC ACID	
		ug./mg. V.P.	ug./organ
184	140	0.29	41.
185	96		28.
186	142		41.
183	101	0.23	23.
187	100		23.
189	188		43.
191	141	0.18	24.
192	96		16.
194	108		18.
Mean		0.23	28.
S.E.		0.032	3.46
n		3	9

NOTE: The following samples contained too little citric acid to be detected by the method employed, in spite of the fact that they contained goodly amounts of tissue. Since this problem occurred only in animals without adrenals receiving cortisone acetate it was deemed worthy of mention.

171	115	-	-
173	127	-	-

TABLE 59A

TWO-WAY ANALYSIS OF VARIANCE¹

GROUPS 1-3 - UNINJECTED THYMECTOMIZED, SHAM THYMECTOMIZED, UNOPERATED ANIMALS - "SUMMER"
 vs.
 GROUPS 4-6 - UNINJECTED THYMECTOMIZED, SHAM THYMECTOMIZED, UNOPERATED ANIMALS - "WINTER"

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _S
Initial Body Weight	Thoracic Surgery	2	251.	1.78
	Season(Summer > Winter)	1	856.	12.1**
	Interaction	2	40.	0.28
	Error	55	3891.	
	Total	60	5038.	
Final Body Weight	Thoracic Surgery	2	780.	1.11
	Season(Summer > Winter)	1	8695.	24.7***
	Interaction	2	339.	N.S.
	Error	55	19383.	
	Total	60	29197.	

(Grp.1 > Grp.4, F_S = 8.35**; Grp.2 > Grp.5, F_S = 4.74*; Grp.3 > Grp.6, F_S = 8.94**)²

- NOTES: 1. Two-Way Analysis of Variance performed as described by Snedecor and Cochran (Snedecor and Cochran, 1967, pp. 299 - 310).
2. Comparisons in parentheses represent one-way Analysis of Variance comparing only two groups (similar to t-tests, F_S = t²; Snedecor & Cochran, 1967, pp. 267-71).
3. * = .05 > p > .01; ** = .01 > p > .001; *** = p < .001 (Snedecor & Cochran, 1967, p.138).

TABLE 59A - 2

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Ventral Prostate Gland	Thoracic Surgery	2	8652.	4.52*
	Season(Summer> Winter)	1	10789.	11.3**
	Interaction	2	3066.	1.60
	Error	55	52679.	
	Total	60	75186.	
(Grp.1> [Grps.2+3], F _s = 7.99**; Grp.1> Grp.4, F _s = 8.07**; Grp.3> Grp.6, F _s = 5.00*)				
Dorsolateral Prostate Gland	Thoracic Surgery	2	3126.	4.18*
	Season(Summer> Winter)	1	5073.	13.6***
	Interaction	2	954.	1.27
	Error	55	20581.	
	Total	60	29734.	
(Grp.1> [Grps.2+3], F _s = 9.14**; Grp.1> Grp.4, F _s = 8.99**; Grp. 3>Grp.6, F _s = 5.39*)				
Seminal Vesicles	Thoracic Surgery	2	24324.	4.64*
	Season(Summer> Winter)	1	12455.	4.75*
	Interaction	2	1502.	0.29
	Error	54	141471.	
	Total	59	179752.	
(Grp.1> [Grps.2+3] , F _s = 6.26*)				

TABLE 59A - 3

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _S
Coagulating Glands	Thoracic Surgery	2	577.	2.46
	Season(Summer > Winter)	1	937.	7.99**
	Interaction	2	156.	N.S.
	Error	53	6218.	
	Total	58	7888.	
(Grp.1 > [Grps.2+3], F _S = 4.69*; Grp.1 > Grp.4, F _S = 5.04*; Grp.3 > Grp.6, F _S = 2.98, .10 > p > .05)				
Kidneys	Thoracic Surgery	2	214264.	2.20
	Season(Summer > Winter)	1	1044757.	21.4***
	Interaction	2	37768.	N.S.
	Error	55	2681986.	
	Total	60	3978775.	
(Grp.1 > Grp.4, F _S = 5.47*; Grp.2 > Grp.5, F _S = 4.08*; Grp.3 > Grp.6, F _S = 10.1**)				
Testes	Thoracic Surgery	2	61227.	0.565
	Season(Summer > Winter)	1	659739.	12.2**
	Interaction	2	37660.	0.348
	Error	55	2979865.	
	Total	60	3738491.	
(Grp.2 > Grp.5, F _S = 4.73*; Grp.3 > Grp.6, F _S = 3.69, .10 > p > .05)				
Adrenal Glands	Thoracic Surgery	2	75.	1.49
	Season	1	46.	1.82
	Interaction	2	14.	0.28
	Error	55	1384.	
	Total	60	1519.	

TABLE 59A - 4

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Thymus Gland (Grps. 2-3 vs. Grps. 5-6)	Sham Thymectomy	1	4576.	0.27
	Season (Summer > Winter)	1	62781.	3.68 ¹
	Interaction	1	2990.	0.18
	Error	38	648359.	
	Total	41	718706.	
	(Note 1: Season, F _s = 3.68, .10 > p > .05)			
Pituitary Gland	Thoracic Surgery	2	5.1	0.94
	Season (Summer > Winter)	1	8.8	3.26
	Interaction	2	1.1	0.20
	Error	35	94.5	
	Total	40	109.5	
	(.10 > p > .05)			
Ventral Prostate Gland- Acid Phosphatase <u>per</u> <u>Gram</u>	Thoracic Surgery	2	0.02	0.60
	Season (Summer > Winter)	1	0.22	6.59*
	Interaction	2	0.06	1.80
	Error	43	0.72	
	Total	48	1.02	
	(Grp.1 > Grp. 4, F _s = 7.25*; Grp. 2 > Grp.5, F _s = 6.35*)			
Ventral Prostate Gland- Acid Phosphatase <u>per</u> <u>Organ</u>	Thoracic Surgery	2	0.002	1.63
	Season (Summer > Winter)	1	0.014	22.9***
	Interaction	2	0.002	1.63
	Error	51	0.0312	
	Total	56	0.049	
	(Grp.1 > Grp. 4, F _s = 9.65**; Grp.2 > Grp.5, F _s = 4.18*; Grp.3 > Grp.6, F _s = 3.68, .10 > p > .05)			

TABLE 59A - 5

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Ventral Prostate Gland- Alkaline Phosphatase <u>per Gram</u>	Thoracic Surgery	2	0.94	1.47
	Season(Summer > Winter)	1	2.69	8.43**
	Interaction	2	-0.15	0.08
	Error	73	23.27	
	Total	78	26.75	
	(Grp.1 > Grp.4, F _s = 3.52, .10 > p > .05)			
Ventral Prostate Gland- Alkaline Phosphatase <u>per Organ</u>	Thoracic Surgery	2	0.01	0.60
	Season(Summer > Winter)	1	0.17	20.4***
	Interaction	2	0.01	0.60
	Error	51	0.43	
	Total	56	0.62	
	(Grp.1 > Grp.4, F _s = 8.35**; Grp.3 > Grp.6, F _s = 4.38*)			
Dorsolateral Prostate Gland - Acid Phospha- tase <u>per Gram</u>	Thoracic Surgery	2	0.009	0.47
	Season	1	0.010	1.04
	Interaction	2	0.007	0.36
	Error	23	0.221	
	Total	28	0.247	
Dorsolateral Prostate Gland - Acid Phospha- tase <u>per Organ</u>	Thoracic Surgery	2	0.0001	0.61
	Season(Summer > Winter)	1	0.0008	9.83**
	Interaction	2	0.0000	0.00
	Error	33	0.0026	
	Total	38	0.0035	
	(Grp.3 > Grp.6, F _s = 5.19*)			

TABLE 59A - 6

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Dorsolateral Prostate Gland - Alkaline Phosphatase <u>per</u> <u>Gram</u>	Thoracic Surgery	2	0.17	1.21
	Season	1	0.07	1.00
	Interaction	2	-0.02	N.S.
	Error	23	1.60	
	Total	28	1.82	
Dorsolateral Prostate Gland - Alkaline Phosphatase <u>per</u> <u>Organ</u>	Thoracic Surgery	2	0.0003	0.24
	Season	1	0.0011	0.89
	Interaction	2	0.0004	0.32
	Error	33	0.0205	
	Total	38	0.0223	

TABLE 60A

TWO-WAY ANALYSIS OF VARIANCE

GROUPS 1-3 - UNINJECTED THYMECTOMIZED, SHAM THYMECTOMIZED, UNOPERATED ANIMALS - "SUMMER"
 vs.
 GROUPS 7-9 - SALINE INJECTED THYMECTOMIZED, SHAM THYMECTOMIZED, UNOPERATED ANIMALS-"SUMMER"

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _S
Initial Body Weight	Thoracic Surgery	2	193.	1.09
	Saline Injection	1	700.	7.88**1
	Interaction	2	-87.	0.49
	Error	68	6040.	
	Total	73	7020.	
(1. Injected > Uninjected; Grp. 9 > Grp. 3, F _S = 4.10*)				
Final Body Weight	Thoracic Surgery	2	703.	0.84
	Saline Injection (Injected > Uninjected)	1	2402.	5.75*
	Interaction	2	128.	0.15
	Error	68	28390.	
	Total	73	31623.	
Ventral Prostate Gland	Thoracic Surgery (uninjected only - see Table 59A)	2	9196.	4.02*
	Saline Injection	1	63.	0.055
	Interaction	2	883.	0.39
	Error	68	77707.	
	Total	73	87849.	

TABLE 60A - 2

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Dorsolateral Prostate Gland	Thoracic Surgery	2	3494.	4.14*
	(Effect in Uninjected, see Table 59A)			
	Saline Injection	1	319.	0.76
	Interaction	2	473.	0.56
	Error	68	28679.	
	Total	73	32965.	
Seminal Vesicles	Thoracic Surgery	2	15629.	2.51
	(Effect in uninjected, see Table 59A)			(.10 > p > .05)
	Saline Injection	1	11855.	3.80
	(Injected > Uninjected)			(.10 > p > .05)
	Interaction	2	5748.	0.92
	Error	68	211841.	
	Total	73	245073.	
	(Grp. 9 > Grp. 3, F _s = 3.47, .10 > p > .05)			
Coagulating Glands	Thoracic Surgery	2	519.	1.49
	Saline Injection	1	193.	1.11
	Interaction	2	188.	0.54
	Error	67	11693.	
	Total	72	12593.	
Testes	Thoracic Surgery	2	59193.	0.38
	Saline Injection	1	39697.	0.52
	Interaction	2	19402.	0.12
	Error	68	5239653.	
	Total	73	5357945.	

TABLE 60A - 3

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Kidneys	Thoracic Surgery	2	93966.	0.94
	Saline Injection	1	37743.	0.76
	Interaction	2	42679.	0.43
	Error	68	3381992.	
	Total	73	3556380.	
Adrenal Glands	Thoracic Surgery	2	104.9	2.06
	Saline Injection	1	5.8	0.23
	Interaction	2	4.3	0.08
	Error	68	1737.0	
	Total	73	1852.0	
Thymus Gland (Grps.2-3 vs. Grps.8-9)	Sham Thymectomy	1	1728.	0.14
	Saline Injection	1	15925.	1.26
	Interaction	1	3459.	0.27
	Error	47	594385.	
	Total	50	615497.	
Pituitary Gland	Thoracic Surgery	2	2.30	0.45
	Saline Injection (Injected > Uninjected)	1	10.30	4.06 (p ≈ .05)
	Interaction	2	6.30	1.24
	Error	37	94.1	
	Total	42	113.0	

(Grp.9 > Grp.3, F_s = 5.21*)

TABLE 60A - 4

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Ventral Prostate Gland- Acid Phosphatase <u>per</u> <u>Gram</u>	Thoracic Surgery	2	0.057	1.94
	Saline Injection	1	0.197	13.40***
	(Injected > Uninjected)			
	Interaction	2	0.054	1.84
	Error	58	0.855	
	Total	63	1.163	
	(Grp.8 > Grp.2, F _s = 10.88**; Grp.8 > Grp.9, F _s = 5.24*)			
Ventral Prostate Gland- Acid Phosphatase <u>per</u> <u>Organ</u>	Thoracic Surgery	2	0.0026	2.12
	Saline Injection	1	0.0055	8.97**
	(Injected > Uninjected)			
	Interaction	2	0.0015	1.22
	Error	61	0.0374	
	Total	66	0.0470	
	(Grp. 8 > Grp.2, F _s = 5.49*)			
Ventral Prostate Gland- Alkaline Phosphatase <u>per</u> <u>Gram</u>	Thoracic Surgery	2	0.78	0.60
	Saline Injection	1	1.91	2.93
	(Injected > Uninjected)			(.10 > p > .05)
	Interaction	2	0.52	0.40
	Error	58	37.75	
	Total	63	40.96	
Ventral Prostate Gland- Alkaline Phosphatase <u>per Organ</u>	Thoracic Surgery	2	0.010	0.46
	Saline Injection	1	0.063	5.83*
	(Injected > Uninjected)			
	Interaction	2	0.016	0.74
	Error	61	0.660	
	Total	66	0.749	
	(Grp.8 > Grp.2, F _s = 3.19, .10 > p > .05)			

TABLE 60A - 5

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Dorsolateral Prostate Gland - Acid Phospha- tase <u>per Gram</u>	Thoracic Surgery	2	0.009	0.53
	Saline Injection	1	0.041	4.82*
	(Injected < Uninjected)			
	Interaction	2	0.011	0.65
	Error	38	0.323	
	Total	43	0.384	
(Grp.9 < Grp.3, F _s = 4.00, .10 > p > .05)				
Dorsolateral Prostate Gland - Acid Phospha- tase <u>per Organ</u>	Thoracic Surgery	2	0.00004	0.24
	Saline Injection	1	0.00009	1.10
	Interaction	2	0.00003	0.18
	Error	45	0.00367	
	Total	50	0.00383	
Dorsolateral Prostate Gland - Alkaline Phosphatase <u>per Gram</u>	Thoracic Surgery	2	0.080	1.06
	Saline Injection	1	0.006	0.079
	Interaction	2	0.169	1.12
	Error	38	2.869	
	Total	43	3.124	
Dorsolateral Prostate Gland - Alkaline Phosphatase <u>per Organ</u>	Thoracic Surgery	2	0.0010	0.70
	Saline Injection	1	0.0006	0.86
	Interaction	2	0.0007	0.48
	Error	45	0.0329	
	Total	50	0.0352	

TABLE 60A - 6

UNINJECTED THYMECTOMIZED, SHAM THYMECTOMIZED, UNOPERATED ANIMALS - "ALL SEASONS"
 vs.
 SALINE INJECTED THYMECTOMIZED, SHAM THYMECTOMIZED, UNOPERATED ANIMALS - "ALL SEASONS"

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Ventral Prostate Gland- Citric Acid <u>per</u> <u>Milligram</u>	Thoracic Surgery	2	0.002	0.021
	Saline Injection	1	0.165	3.47
	(Injected < Uninjected)			(.10 > p > .05)
	Interaction	2	0.087	0.92
	Error	22	1.045	
	Total	27	1.299	

(Saline Injected Thymectomized < Uninjected Thymectomized, F_s = 4.74*)

Ventral Prostate Gland- Citric Acid <u>per</u> <u>Organ</u>	Thoracic Surgery	2	5309.	2.81	145
	(Uninjected T > [S+U], F _s = 12.48***)			(.10 > p > .05)	
	Saline Injection	1	7331.	7.76**	
	(Injected < Uninjected)				
	Interaction	2	8199.	4.34*	
	Error	89	84076.		
Total	94	104915.			

(Saline Injected Thymectomized < Uninjected Thymectomized, F_s = 10.72**;
 Interaction of thymectomy with saline injection, F_s = 4.45*, i.e. saline
 injection and thymectomy interact to give a greater decrease in citric
 acid per organ than either thymectomy or saline injection alone).

TABLE 61A

TWO-WAY ANALYSIS OF VARIANCE

GROUPS 7-9 - SALINE INJECTED THYMECTOMIZED, SHAM THYMECTOMIZED, UNOPERATED ANIMALS-"SUMMER"
 vs.
 GROUPS 10-12 - TESTOSTERONE INJECTED THYMECTOMIZED-GONADECTOMIZED, SHAM THYMECTOMIZED-
 GONADECTOMIZED, GONADECTOMIZED ANIMALS - "SUMMER"

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Initial Body Weight	Thoracic Surgery	2	124.	0.56
	Gonadectomy+Testosterone	1	301.	2.73
	Interaction	2	48.	0.22
	Error	88	9854.	
	Total	93	10327.	
Final Body Weight	Thoracic Surgery	2	62.	0.059
	Gonadectomy+Testosterone	1	1000.	1.89
	Interaction	2	498.	0.47
	Error	88	46492.	
	Total	93	48052.	
Ventral Prostate Gland	Thoracic Surgery	2	591.	0.14
	Gonadectomy+Testosterone	1	33649.	16.4***
	(All gonadectomized < all saline injected)			
	Interaction	2	1130.	0.28
	Error	88	180549.	
Total	93	215919.		

(Grp.10 < Grp.7, F_s = 5.70*)

TABLE 61A - 2

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Dorsolateral Prostate Gland	Thoracic Surgery	2	347.	0.32
	Gonadectomy+Testosterone (Grps.10-12 < Grps.7-9)	1	5577.	10.41**
	Interaction	2	403.	0.38
	Error	88	47126.	
	Total	93	53453.	
	(Grp. 10 < Grp. 7, F _s = 3.63. .10 > p > .05)			
Seminal Vesicles	Thoracic Surgery	2	1440.	0.17
	Gonadectomy+Testosterone (Grps.10-12 < Grps.7-9)	1	68218.	15.83***
	Interaction	2	5176.	0.60
	Error	88	379218.	
	Total	93	454052.	
	(Grp.10 < Grp.7, F _s = 5.28*; Grp.12 < Grp.9, F _s = 4.83*)			
(NOTE: See Table 61A-2a for Single Classification ANOVA of Seminal Vesicle Weights)				
Coagulating Glands	Thoracic Surgery	2	29.	0.062
	Gonadectomy+Testosterone (Grps.10-12 < Grps.7-9)	1	2260.	9.61**
	Interaction	2	127.	0.27
	Error	87	20450.	
	Total	92	22866.	
	(Grp.10 < Grp.7, F _s = 3.07, .10 > p > .05)			
Kidneys	Thoracic Surgery	2	2943.	0.022
	Gonadectomy+Testosterone	1	9155.	0.14
	Interaction	2	11625.	0.088
	Error	88	5805253.	
	Total	93	5828976.	

TABLE 61A - 2a

SINGLE CLASSIFICATION ANALYSIS OF VARIANCE¹

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Seminal Vesicles (Grp.7 > Grp.10)	Gonadectomy+Testosterone	1	31298.	10.2**
	Error	27	82989.	
	Total	28	114287.	
Seminal Vesicles ² (Grp.8 vs. Grp.11)	Gonadectomy+Testosterone	1	8579.	1.49
	Error	29	166624.	
	Total	30	175203.	
Seminal Vesicles ³ (Grp.9 > Grp.12)	Gonadectomy+Testosterone	1	33517.	8.28**
	Error	32	129605.	
	Total	33	163122.	

NOTE: 1 Single Classification Analysis of Variance performed as described by Snedecor and Cochran(Snedecor and Cochran, 1967, pp. 258-279).

2 Seminal Vesicle weights of Group 11 animals non-normally distributed (See Table 1A).

3 Seminal Vesicle weights of Group 12 animals exhibit a distribution of questionable normality(See Table 1A).

TABLE 61A - 3

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Adrenal Glands	Thoracic Surgery	2	52.	0.65
	Gonadectomy+Testosterone	1	153.	3.82
	(Grps.10-12 tend to be greater than Grps.7-9) (.10 > p > .05)			
	Interaction	2	3.	0.04
	Error	87	3489.	
	Total	92	3697.	
Thymus Gland (Grps.11,12 vs. Grps.8,9)	Sham Thymectomy	1	780.	0.039
	Gonadectomy+Testosterone	1	32696.	1.62
	Interaction	1	11.	0.0006
	Error	61	1228260.	
	Total	64	1261747.	
Pituitary Gland	Thoracic Surgery	2	4.1	1.07
	Gonadectomy+Testosterone	1	12.4	6.49*
	(Grps.10-12 > Grps.7-9)			
	Interaction	2	2.2	0.58
	Error	55	105.2	
	Total	60	123.9	
(Grp.11 > Grp.8, F _s = 4.02, p ≈ .05)				
Ventral Prostate Gland- Acid Phosphatase <u>per</u> <u>Gram</u>	Thoracic Surgery	2	0.024	0.39
	Gonadectomy+Testosterone	1	0.055	1.78
	Interaction	2	0.092	1.49
	Error	65	2.010	
	Total	70	2.181	
(Grp.11 < Grp.8, F _s = 3.74, .10 > p > .05)				

TABLE 61A - 4

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Ventral Prostate Gland- Acid Phosphatase <u>per</u> <u>Organ</u>	Thoracic Surgery	2	0.0008	0.56
	Gonadectomy+Testosterone (Grps. 10-12 < Grps. 7-9)	1	0.0336	47.2***
	Interaction	2	0.0003	0.21
	Error	83	0.0591	
	Total	88	0.0938	
(Grp.10 < Grp.7, F _s = 10.15**; Grp.11 < Grp.8, F _s = 12.94***; Grp.12 < Grp.9, F _s = 7.69**)				
Ventral Prostate Gland- Alkaline Phosphatase <u>per Gram</u>	Thoracic Surgery	2	0.55	0.39
	Gonadectomy+Testosterone	1	0.98	1.40
	Interaction	2	1.05	0.75
	Error	65	45.34	
	Total	70	47.92	
Ventral Prostate Gland- Alkaline Phosphatase <u>per Organ</u>	Thoracic Surgery	2	0.004	0.12
	Gonadectomy+Testosterone (Grps. 10-12 < Grps.7-9)	1	0.216	13.01***
	Interaction	2	0.005	0.15
	Error	83	1.379	
	Total	88	1.604	
(Grp.11 < Grp.8, F _s = 4.01*)				
Dorsolateral Prostate Gland-Acid Phospha- tase <u>per Gram</u>	Thoracic Surgery	2	0.004	0.34
	Gonadectomy+Testosterone (Grps.10-12 > Grps.7-9)	1	0.229	39.5***
	Interaction	2	0.012	1.03
	Error	50	0.290	
	Total	55	0.535	
(Grp.10 > Grp.7, F _s = 11.66**; Grp.11 > Grp.8, F _s = 5.59*; Grp.12 > Grp.9, F _s = 17.66***)				

TABLE 61A - 5

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Dorsolateral Prostate Gland - Acid Phosphatase <u>per Organ</u>	Thoracic Surgery	2	0.00000	0.00
	Gonadectomy+Testosterone	1	0.00003	0.029
	Interaction	2	0.00011	0.52
	Error	63	0.00662	
	Total	68	0.00676	
Dorsolateral Prostate Gland - Alkaline Phosphatase <u>per Gram</u>	Thoracic Surgery	2	0.122	1.17
	Gonadectomy+Testosterone (Grps. 10-12 < Grps. 7-9)	1	0.444	8.57**
	Interaction	2	0.041	0.40
	Error	50	2.592	
	Total	55	3.199	
	(Grp.11 < Grp.8, F _s = 4.59*)			
Dorsolateral Prostate Gland - Alkaline Phosphatase <u>per Organ</u>	Thoracic Surgery	2	0.0027	2.01
	Gonadectomy+Testosterone (Grps.10-12 < Grps.7-9)	1	0.0129	19.17***
	Interaction	2	-0.0001	0.08
	Error	63	0.0424	
	Total	68	0.0579	
	(Grp.10 < Grp.7, F _s = 5.85*; Grp.11 < Grp.8, F _s = 5.00*; Grp.12 < Grp.9, F _s = 3.71, .10 > p > .05)			

TABLE 61A - 6

SALINE INJECTED THYMECTOMIZED, SHAM THYMECTOMIZED, UNOPERATED ANIMALS - "ALL SEASONS"
 vs.
 TESTOSTERONE INJECTED THYMECTOMIZED-GONADECOTOMIZED, SHAM THYMECTOMIZED-GONADECOTOMIZED,
 GONADECOTOMIZED ANIMALS - "SUMMER"

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Ventral Prostate Gland- Citric Acid <u>per</u> <u>Milligram</u>	Thoracic Surgery	2	0.054	0.47
	Gonadectomy+Testosterone (Groups 10-12 > Groups 7-9)	1	0.264	4.57*
	Interaction	2	0.057	0.48
	Error	23	1.329	
	Total	28	1.704	
Ventral Prostate Gland- Citric Acid <u>per</u> <u>Organ</u>	Thoracic Surgery	2	561.	0.27
	Gonadectomy+Testosterone	1	2.	0.002
	Interaction	2	786.	0.38
	Error	85	87413.	
	Total	90	88762.	

TABLE 62A

TWO-WAY ANALYSIS OF VARIANCE

GROUPS 7-9 - SALINE INJECTED THYMECTOMIZED, SHAM THYMECTOMIZED, UNOPERATED ANIMALS - "SUMMER"
 vs.
 GROUPS 13-15 - CORTISONE ACETATE INJECTED THYMECTOMIZED-ADRENALECTOMIZED, SHAM THYMECTOMIZED-
 ADRENALECTOMIZED, ADRENALECTOMIZED ANIMALS - "SUMMER"

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Initial Body Weight	Thoracic Surgery	2	265.	1.42
	Adrenalectomy + Cortisone Acetate	1	414.	4.44*
	Interaction	2	54.	0.29
	Error	64	5973.	
	Total	69	6706.	
	(Grp.13 > Grp.7, F _s = 2.63, .10 > p > .05)			
Final Body Weight	Thoracic Surgery	2	2144.	1.39
	Adrenalectomy + Cortisone Acetate	1	5233.	6.79*
	Interaction	2	1838.	1.19
	Error	63	48560.	
	Total	68	57775.	
	(Grp.15 < Grp.9, F _s = 5.84*; Grp.14 > Grp.15, F _s = 3.43, .10 > p > .05)			
Ventral Prostate Gland	Thoracic Surgery	2	1067.	0.39
	Adrenalectomy + Cortisone Acetate	1	506.	0.37
	Interaction	2	840.	0.31
	Error	63	86154.	
	Total	68	88567.	

TABLE 62A - 2

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Dorsolateral Prostate Gland	Thoracic Surgery	2	1397.	1.18
	Adrenalectomy + Cortisone Acetate	1	1445.	2.43
	Interaction	2	-214.	0.18
	Error	63	37418.	
	Total	68	40046.	
Seminal Vesicles	Thoracic Surgery	2	9397.	0.92
	Adrenalectomy + Cortisone Acetate	1	14159.	2.76
	Interaction	2	-1057.	0.10
	Error	63	323295.	
	Total	68	345794.	
Coagulating Glands	Thoracic Surgery	2	46.	0.11
	Adrenalectomy + Cortisone Acetate	1	53.	0.25
	Interaction	2	142.	0.34
	Error	63	13163.	
	Total	68	13404.	
Testes	Thoracic Surgery	2	21337.	0.12
	Adrenalectomy + Cortisone Acetate	1	15307.	0.17
	Interaction	2	31303.	0.18
	Error	63	5551679.	
	Total	68	5619626.	

TABLE 62A - 3

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Kidneys	Thoracic Surgery	2	226340.	1.18
	Adrenalectomy + Cortisone Acetate	1	155571.	1.62
	Interaction	2	290710.	1.52
	Error	63	6040918.	
	Total	68	6713539.	
Thymus Gland (Grps.14,15 vs. Grps.8,9)	Sham Thymectomy	1	9.0	0.001
	Adrenalectomy + Cortisone Acetate	1	49237.	5.75*
	Interaction	1	219.	0.026
	Error	41	351164.	
	Total	44	400629.	
	(Grp. 14 > Grp. 8, F _s = 2.94, .10 > p > .05)			
Pituitary Gland	Thoracic Surgery	2	9.8	1.43
	Adrenalectomy + Cortisone Acetate	1	1.4	0.41
	Interaction	2	17.5	2.56 (.10 > p > .05)
	Error	56	191.7	
	Total	61	220.4	
(Grp.15 < Grp.9, F _s = 5.48*; Grp.14 > Grp.15, F _s = 4.40*; Interaction: Sham Thymectomy in conjunction with adrenalectomy and subsequent cortisone acetate administration tends to result in increased pituitary weight while adrenalectomy and cortisone acetate alone tend to decrease pituitary weight.)				

TABLE 62A - 4

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Ventral Prostate Gland- Acid Phosphatase <u>per</u> <u>Gram</u>	Thoracic Surgery	2	0.005	0.13
	Adrenalectomy + Cortisone Acetate	1	0.187	10.05**
	Interaction	2	0.152	4.09*
	Error	55	1.026	
	Total	60	1.370	

(Grp.14 < Grp.8, F_s = 14.54***; Interaction: Sham thymectomy + Adrenalectomy and subsequent cortisone acetate administration leads to a greater decrease in Ventral Prostate Acid Phosphatase per Gram than does adrenalectomy with cortisone acetate alone, while sham thymectomy in saline injected animals with intact adrenals leads to a marked increase in this parameter, F_s = 5.14*.)

Ventral Prostate Gland- Acid Phosphatase <u>per</u> <u>Organ</u>	Thoracic Surgery	2	0.0001	0.06
	Adrenalectomy + Cortisone Acetate	1	0.0049	6.03*
	Interaction	2	0.0019	1.17
	Error	58	0.0471	
	Total	63	0.0540	
		(Grp.14 < Grp.8, F _s = 4.73*)		

Ventral Prostate Gland- Alkaline Phosphatase <u>per Gram</u>	Thoracic Surgery	2	0.50	0.30
	Adrenalectomy + Cortisone Acetate	1	0.38	0.45
	Interaction	2	0.44	0.26
	Error	55	46.36	
	Total	60	47.68	

TABLE 62A - 5

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Ventral Prostate Gland- Alkaline Phosphatase <u>per Organ</u>	Thoracic Surgery	2	0.003	0.12
	Adrenalectomy + Cortisone Acetate	1	0.032	2.48
	Interaction	2	-0.001	0.04
	Error	58	0.746	
	Total	63	0.780	
Dorsolateral Prostate Gland - Acid Phospha- tase <u>per Gram</u>	Thoracic Surgery	2	0.004	0.37
	Adrenalectomy + Cortisone Acetate	1	0.008	1.48
	Interaction	2	0.010	0.93
	Error	52	0.282	
	Total	57	0.304	
Dorsolateral Prostate Gland - Acid Phospha- tase <u>per Organ</u>	Thoracic Surgery	2	0.00026	1.49
	Adrenalectomy + Cortisone Acetate	1	0.00027	3.10
	Interaction	2	0.00017	0.98
	Error	59	0.00511	
	Total	64	0.00581	
Dorsolateral Prostate Gland - Alkaline Phosphatase <u>per Gram</u>	Thoracic Surgery	2	0.166	1.36
	Adrenalectomy + Cortisone Acetate	1	0.292	4.78*
	Interaction	2	0.254	2.08
	Error	52	3.179	
	Total	57	3.891	

(Grp.15 > Grp.9, F_s = 6.29*; Grp.14 < Grp.15, F_s = 3.46, .10 > p > .05; Interaction: while adrenalectomy plus subsequent cortisone acetate administration and sham thymectomy in saline injected animals result in increased alkaline phosphatase per gram of dorsolateral prostate gland, sham thymectomy plus adrenalectomy and subsequent cortisone acetate tend to decrease this parameter, F_s = -3.86, .10 > p > .05)

TABLE 62A - 6

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Dorsolateral Prostate	Thoracic Surgery	2	0.0051	2.72
Gland - Alkaline	Adrenalectomy +	1	0.0050	5.34*
Phosphatase <u>per</u>	Cortisone Acetate			
<u>Organ</u>	Interaction	2	0.0032	1.71
	Error	59	0.0553	
	Total	64	0.0686	

(Grp.14 < Grp.15, F_s = 3.35, .10 > p > .05; Grp.15 > Grp.9, F_s = 5.23*; Interaction: while adrenalectomy with subsequent cortisone acetate administration and sham thymectomy in saline injected animals with intact adrenals tend to increase alkaline phosphatase per organ, sham thymectomy with adrenalectomy and cortisone acetate injection tend to decrease this parameter, F_s = 3.08, .10 > p > .05.)

TABLE 62A - 7

SALINE INJECTED THYMECTOMIZED, SHAM THYMECTOMIZED, UNOPERATED ANIMALS - "ALL SEASONS"
 vs.
 CORTISONE ACETATE INJECTED THYMECTOMIZED-ADRENALECTOMIZED, SHAM THYMECTOMIZED-ADRENALECT-
 OMIZED, ADRENALECTOMIZED ANIMALS - "SUMMER"

	SOURCE OF VARIATION	D.F.	SUM OF SQUARES	F _s
Ventral Prostate Gland- Citric Acid <u>per</u> <u>Milligram</u>	Thoracic Surgery	2	0.018	0.27
	Adrenalectomy + Cortisone Acetate	1	0.076	2.28
	Interaction	2	0.020	0.30
	Error	19	0.634	
	Total	24	0.748	
Ventral Prostate Gland- Citric Acid <u>per</u> <u>Organ</u>	Thoracic Surgery	2	397.	0.29
	Adrenalectomy + Cortisone Acetate	1	2831. (Grps.13-15 < Grps.7-9)	4.15*
	Interaction	2	295.	0.22
	Error	59	40211.	
	Total	64	43734.	

TABLE 63A

THE COVARIANCE F-TEST IN A ONE-WAY CLASSIFICATION¹

GROUP 1 - UNINJECTED THYMECTOMIZED ANIMALS - "SUMMER"
 vs.
 GROUP 4 - UNINJECTED THYMECTOMIZED ANIMALS - "WINTER"

X = Initial Body Wt.

Y = Ventral Prostate Gland Wt.

Source of Variation	D.F.	$\sum x^2$	$\sum xy$	$\sum y^2$	Reduction	Deviations From Regression		
						D.F.	Sum Of Squares	Mean Square
Treatments	1	449.	1907.	8118.				
Error	17	910.	212.	10321.	49.4	16	10272.	642.0
Treatments + Error	18	1359.	2119.	18439.	3303.5	17	15136.	
					Treatments	1	4863.9	4863.9

$$F_{16}^1 = \frac{4863.9}{642.0} = 7.58^*$$

Ventral Prostate Glands: Mean Weights adjusted for Initial Body Weight.

GROUP 1: $\bar{Y}_{adj.} = 145$ mgs.

GROUP 4: $\bar{Y}_{adj.} = 101$ mgs.

NOTE: 1 Reference: Snedecor and Cochran, 1967, pp.419 - 425.

TABLE 64A

THE COVARIANCE F-TEST IN A ONE-WAY CLASSIFICATION

GROUP 1 - UNINJECTED THYMECTOMIZED ANIMALS - "SUMMER"
 vs.
 GROUP 4 - UNINJECTED THYMECTOMIZED ANIMALS - "WINTER"

X = Final Body Weight
 Y = Ventral Prostate Gland Wt.

Source of Variation	D.F.	Σx^2	Σxy	Σy^2	Reduction	DEVIATIONS FROM REGRESSION		
						D.F.	Sum of Squares	Mean Square
Treatments	1	3263.	5147.	8198.				
Error	17	5178.	1398.	10241.	3774.	16	6467.	404.2
Treatments + Error	18	8441.	6545.	18439.	5074.	17	13365.	
					Treatments	1	6898.	6898.

$$F_{16}^1 = \frac{6898}{404.2} = 17.06***$$

Ventral Prostate Glands: Mean Weights adjusted for Final Body Weight.

GROUP 1: $\bar{Y}_{adj.} = 144$ mgs.

GROUP 4: $\bar{Y}_{adj.} = 105$ mgs.

TABLE 65A

THE COVARIANCE F-TEST IN A ONE-WAY CLASSIFICATION

GROUP 3 - UNINJECTED UNOPERATED ANIMALS - "SUMMER"
 vs.
 GROUP 6 - UNINJECTED UNOPERATED ANIMALS - "WINTER".

X = Initial Body Weight

Y = Ventral Prostate Gland Wt.

Source of Variation	D.F.	Σx^2	Σxy	Σy^2	Reduction	DEVIATIONS FROM REGRESSION		
						D.F.	Sum of Squares	Mean Square
Treatments	1	205.	1021.	5079.				
Error	18	1346.	1365.	20945.	1384.	17	19561.	1151.
Treatments + Error	19	1551.	2386.	26024.	3670.	18	22354.	
					Treatments	1	2793.	2793.

$$F_{17}^1 = \frac{2793.}{1151.} = 2.43 \text{ N.S.}$$

Ventral Prostate Glands: Mean Weights adjusted for Initial Body Weight.

GROUP 3: $\bar{Y}_{adj.} = 112$ mgs.

GROUP 6: $\bar{Y}_{adj.} = 82$ mgs.

TABLE 66A

THE COVARIANCE F-TEST IN A ONE-WAY CLASSIFICATION

GROUP 3 - UNINJECTED UNOPERATED ANIMALS - "SUMMER"
 vs.
 GROUP 6 - UNINJECTED UNOPERATED ANIMALS - "WINTER"

X = Final Body Weight

Y = Ventral Prostate Gland Wt.

Source of Variation	D.F.	Σx^2	Σxy	Σy^2	Reduction	DEVIATIONS FROM REGRESSION		
						D.F.	Sum of Squares	Mean Square
Treatments	1	3435.	4177.	5079.				
Error	18	7277.	9091.	20945.	11357.	17	9588.	564.
Treatments + Error	19	10712.	13268.	26024.	16434.	18	9590.	
					Treatments	1	2.	2.

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$$F_{17}^1 = \frac{2.}{564.} = 0.0035 \text{ N.S.}$$

Ventral Prostate Glands: Mean Weights adjusted for Final Body Weight.

GROUP 3: $\bar{Y}_{adj.} = 104$ mgs.

GROUP 6: $\bar{Y}_{adj.} = 105$ mgs.

TABLE 67A

GROUP 3 - UNINJECTED UNOPERATED ANIMALS - "SUMMER"

X = Initial Body Weight

vs.

GROUP 9 - SALINE INJECTED UNOPERATED ANIMALS - "SUMMER"

Y = Seminal Vesicle Weight

Source of Variation	D.F.	$\sum x^2$	$\sum xy$	$\sum y^2$	Reduction	DEVIATIONS FROM REGRESSION		
						D.F.	Sum of Squares	Mean Square
Treatments	1	459.	2622.	14970.				
Error	24	2041.	2336.	81750.	2674.	23	79076.	3438.
Treatments + Error	25	2500.	4958.	96720.	9833.	24	86887.	
					Treatments	1	7811.	7811.

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$$F_{23}^1 = \frac{7811.}{3438.} = 2.27 \text{ N.S.}$$

Seminal Vesicles: Mean Weights adjusted for Initial Body Weight.

GROUP 3: $\bar{Y}_{adj.} = 108$ mgs.

GROUP 6: $\bar{Y}_{adj.} = 146$ mgs.

TABLE 68A

THE COVARIANCE F-TEST IN A ONE-WAY CLASSIFICATION

GROUP 3 - UNINJECTED UNOPERATED ANIMALS - "SUMMER"

X = Final Body Weight

vs.

GROUP 9 - SALINE INJECTED UNOPERATED ANIMALS - "SUMMER"

Y = Seminal Vesicle Wt.

Source of Variation	D.F.	Σx^2	Σxy	Σy^2	Reduction	DEVIATIONS FROM REGRESSION		
						D.F.	Sum of Squares	Mean Square
Treatments	1	1261.	4344.	14970.				
Error	24	11086.	15647.	81750.	22084.	23	59666.	2594.
Treatments + Error	25	12347.	19991.	96720.	32367.	24	64353.	
					Treatments	1	4687.	4687.

$$F_{23}^1 = \frac{4687.}{2594.} = 1.81 \text{ N.S.}$$

Seminal Vesicles: Mean Weights adjusted for Final Body Weight.

GROUP 3 : $\bar{Y}_{adj.} = 111 \text{ mgs.}$

GROUP 9 : $\bar{Y}_{adj.} = 141 \text{ mgs.}$

TABLE 69A

THE COVARIANCE F-TEST IN A ONE-WAY CLASSIFICATION

GROUP 3 - UNINJECTED UNOPERATED ANIMALS - "SUMMER"

X = Initial Body Weight

vs.

GROUP 9 - SALINE INJECTED UNOPERATED ANIMALS - "SUMMER"

Y = Pituitary Gland Weight

Source of Variation	D.F.	$\sum x^2$	$\sum xy$	$\sum y^2$	Reduction	DEVIATIONS FROM REGRESSION		
						D.F.	Sum of Squares	Mean Square
Treatments	1	453.	82.4	14.9				
Error	12	822.	67.9	44.0	5.6	11	38.4	3.49
Treatments + Error	13	1275.	150.3	58.9	17.7	12	41.2	
					Treatments	1	2.8	2.80

$$F_{11}^1 = \frac{2.80}{3.49} = 0.80 \text{ N.S.}$$

Pituitary Gland: Mean Weights adjusted for Initial Body Weight.

GROUP 3: $\bar{Y}_{adj.} = 6.5$ mgs.

GROUP 9: $\bar{Y}_{adj.} = 7.9$ mgs.

TABLE 70A

THE COVARIANCE F-TEST IN A ONE-WAY CLASSIFICATION

GROUP 3 - UNINJECTED UNOPERATED ANIMALS - "SUMMER"

X = Final Body Weight

vs.

GROUP 9 - SALINE INJECTED UNOPERATED ANIMALS - "SUMMER"

Y = Pituitary Gland Weight

Source of Variation	D.F.	$\sum x^2$	$\sum xy$	$\sum y^2$	Reduction	DEVIATIONS FROM REGRESSION		
						D.F.	Sum of Squares	Mean Square
Treatments	1	924.	117.5	14.9				
Error	12	5301.	297.3	44.0	16.7	11	27.3	2.48
Treatments + Error	13	6225.	414.8	58.9	27.6	12	31.3	
					Treatments	1	4.0	4.00

$$F_{11}^1 = \frac{4.00}{2.48} = 1.61 \text{ N.S.}$$

Pituitary Gland: Mean Weight adjusted for Final Body Weight.

$$\text{GROUP 3: } \bar{Y}_{\text{adj.}} = 6.7 \text{ mgs.}$$

$$\text{GROUP 9: } \bar{Y}_{\text{adj.}} = 8.0 \text{ mgs.}$$

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AUTOBIOGRAPHICAL STATEMENT

Lorraine Kathryn Miller (nee Seher) was born in New York City on September 14, 1939. She attended the New York City public schools and was graduated from Grover Cleveland High School in 1956. She earned a B.A. degree from Hunter College in 1960 as a chemistry major and physics minor.

Mrs. Miller was employed as a technician in the laboratory of Dr. Theodore Shedlovsky of the Rockefeller Institute from June, 1960 until September, 1964.

Mrs. Miller began full time graduate studies in September, 1964 as a Master's student in mammalian physiology at Hunter College. In February, 1965 she was matriculated in the doctoral program in biology of the City University of New York. In October of 1965 she was married to David Gearhart Miller.

Her teaching experience has been as a lecturer in Principles of Biology and endocrinology at Hunter College.

Mrs. Miller is a student member of the New York Academy of Sciences and a member of Phi Sigma, AAAS and the Society for the Study of Reproduction. She has recently been approved for membership in Sigma Xi.

Her main area of interest is reproductive endocrinology.