Virtual Rat Endocrine Activity

Based on USING "VIRTUAL RATS" FOR UNDERSTANDING ENDOCRINE PHYSIOLOGY by Sandhia Varyani, Eilynn Sipe, J. P. Layshock, & Stephen E. DiCarlo, Dept. of Physiology, Northeastern Ohio University College of Medicine.

INTRODUCTION AND BACKGROUND:

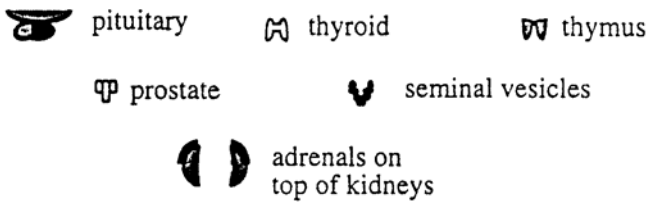
The purpose of this exercise is for you to understand basic principles and important concepts regarding the endocrine system. In this exercise, you will observe the effects of unknown hormones on "virtual rats" and use your knowledge of the endocrine system in determining the hormone used. Control "virtual rats" are provided as normals to which all other values should be compared. Upon careful comparison of the hormone-treated "virtual rats" with the control "virtual rats", you will be able to determine the unknown hormone. This activity is based on the negative feedback control pathways for testosterone, cortisol and thyroid hormones.

Write in the negative feedback control pathways for these hormones below:

PROCEDURE:

In this exercise, you will determine the identity of an unknown hormone by observing the effect it has on the organs of the male rat.

The data for this lab were compiled from seven pairs of male rats; one pair was the control group and the remaining six pairs were experimental groups. In each set, there was an "intact" rat and a "castrate rat." Castration was removal of the testes to eliminate testosterone production. The two rats (normal and castrate) of each group were treated alike in all other ways (food, water, etc). All rats, except for those in the control group were injected with a hormone (**ACTH, cortisol, LH, TRH, testosterone or TSH**) on a daily basis for two weeks, sacrificed humanely and autopsied. Organ weights were measured at autopsy. Using your predictions of hormone effects and the autopsy data, match the rat groups with the hormone they were injected with. The following figure represents the rat organs weighed. The organs below appear on each rat. The pituitary is not drawn to scale; it is drawn larger than actual size. The seminal vesicles and prostate are targets of testosterone.



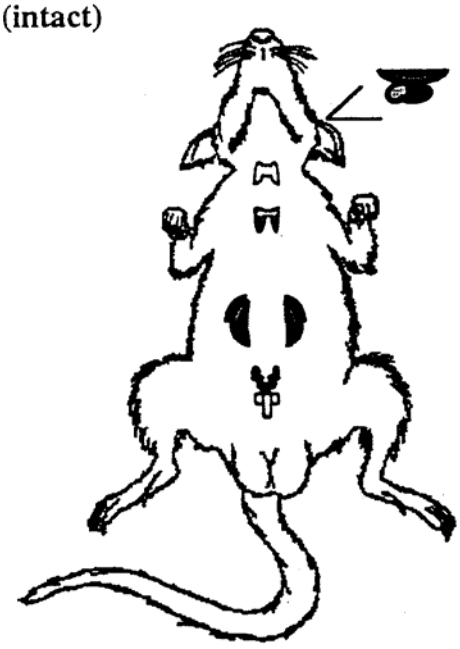
You can use the table below to organize your predictions or to record results. Note that endocrine organs that are hypersecreting tend to hypertrophy (increase in size) and those that are hyposecreting tend to atrophy (decrease in size). Place a + to denote an increase in size, a - to denote a decrease in size in an organ and " NC" if no change occurs.

	Control	Control	Horm 1	Hor m 1	Horm 2	Horm 2	Horm 3	horm 3
	Intact	Castrate	Intact	Castrate	Intact	Castrate	Intact	Castrate
Pituitary gland								
Thyroid gland								
Adrenal glands								
Thymus gland								
Testes								
Prostate								
Sem. Vesicles								
Body weight								
Organ Size								

	Horm 4	Horm 4	Horm 5	Hor m 5	Horm 6	Horm 6
	Intact	Castrate	Intact	Castrate	Intact	Castrate
Pituitary gland						
Thyroid gland						
Adrenal glands						
Thymus gland						
Testes						
Prostate						
Sem. Vesicles						
Body weight						
Organ Size						

This is your set of control rats; the data are the results of the autopsy.

Control
(intact)

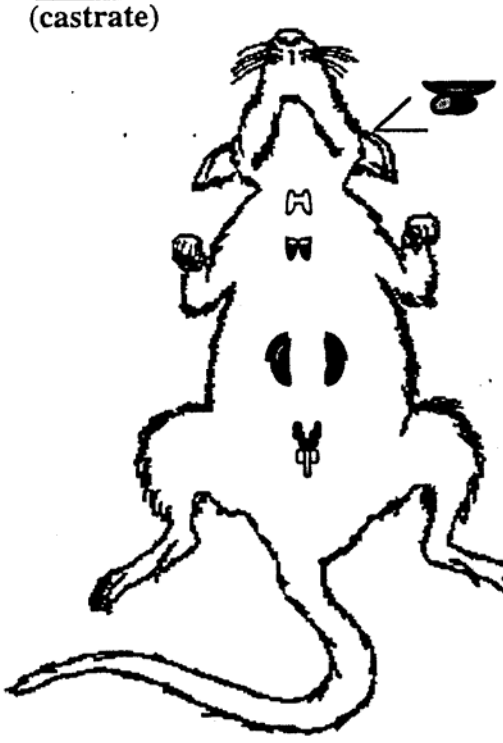


Pituitary: 12.9 mg

Thyroid: 250 mg
Thymus: 475 mg

Adrenals: 40 mg
Seminal vesicles: 500 mg
Prostate: 425 mg
Testes: 3200 mg
Body weight: 300 g

Control
(castrate)



Pituitary: 12.9 mg

Thyroid: 250 mg

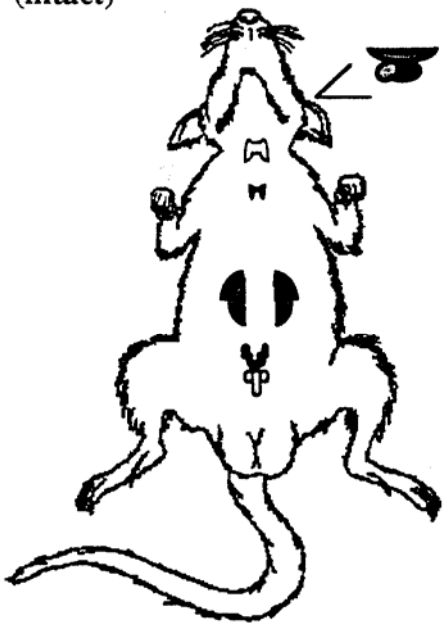
Thymus: 480 mg

Adrenals: 40 mg
Seminal vesicles: 450 mg
Prostate: 387 mg

Body wt.: 270 g

Determine the identity of hormone 1 using the data from the autopsy listed below.

Hormone 1
(intact)

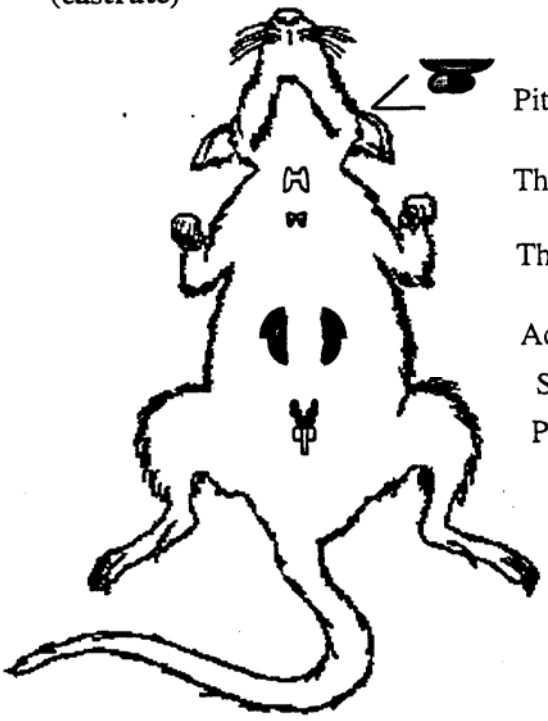


Pituitary: 12.8 mg

Thyroid: 245 mg
Thymus: 150 mg

Adrenals: 100 mg
Seminal vesicles: 490 mg
Prostate: 430 mg
Testes: 3000 mg
Body weight: 200 g

Hormone 1
(castrate)



Pituitary: 12.9 mg

Thyroid: 250 mg

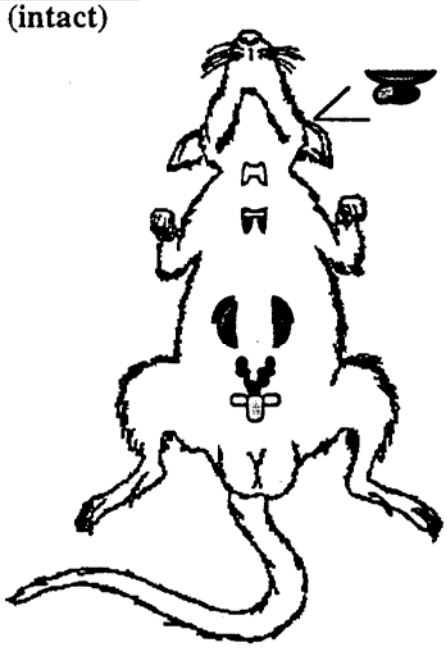
Thymus: 150 mg

Adrenals: 95 mg
Seminal vesicles: 410 mg
Prostate: 380 mg

Body wt.: 195 g

Determine the identity of hormone 2 using the data from the autopsy listed below.

Hormone 2
(intact)

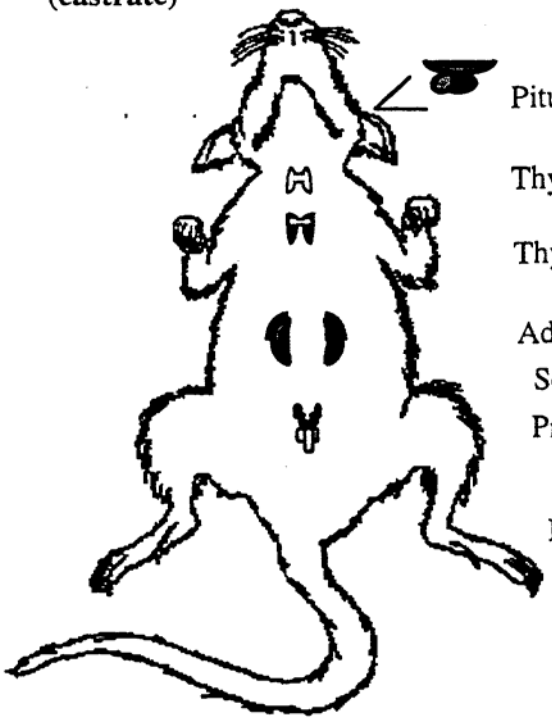


Pituitary: 13.0 mg

Thyroid: 250 mg
Thymus: 480 mg

Adrenals: 40 mg
Seminal vesicles: 900 mg
Prostate: 800 mg
Testes: 5700 mg
Body weight: 310 g

Hormone 2
(castrate)



Pituitary: 13 mg

Thyroid: 250 mg

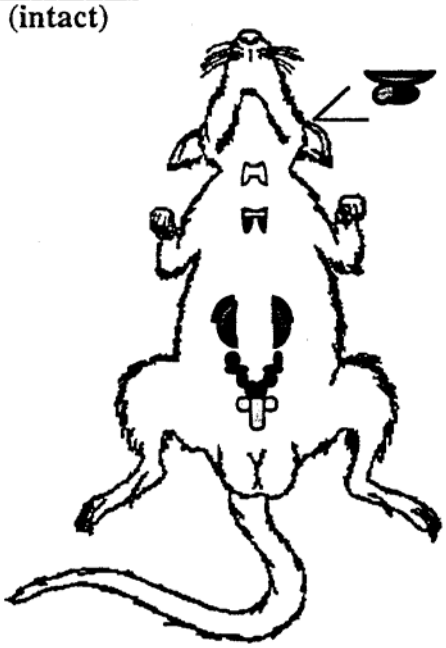
Thymus: 480 mg

Adrenals: 42 mg
Seminal vesicles: 412 mg
Prostate: 375 mg

Body wt.: 275 g

Determine the identity of hormone 3 using the data from the autopsy listed below.

Hormone 3
(intact)

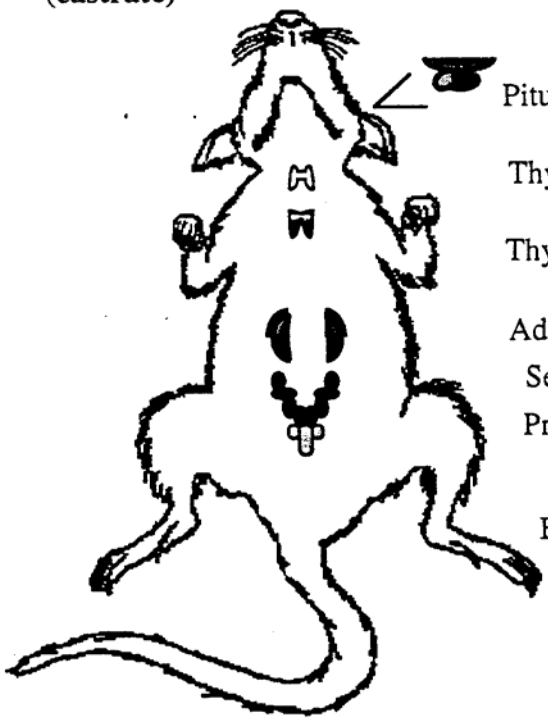


Pituitary: 13.2 mg

Thyroid: 252 mg
Thymus: 470 mg

Adrenals: 38 mg
Seminal vesicles: 1400 mg
Prostate: 900 mg
Testes: 3000 mg
Body weight: 400 g

Hormone 3
(castrate)



Pituitary: 13.3 mg

Thyroid: 250 mg

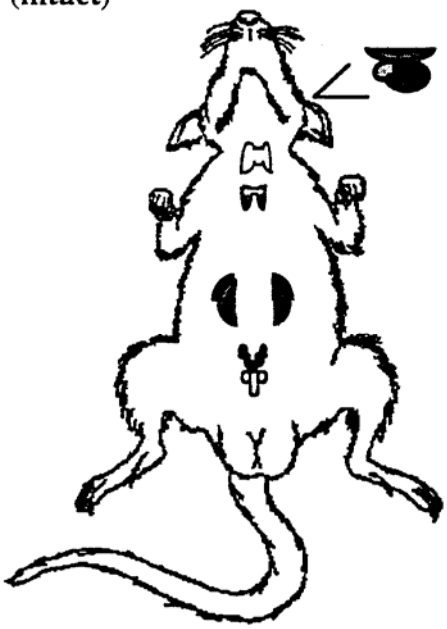
Thymus: 470 mg

Adrenals: 41 mg
Seminal vesicles: 1200 mg
Prostate: 800 mg

Body wt.: 370 g

Determine the identity of hormone 4 using the data from the autopsy listed below.

Hormone 4
(intact)

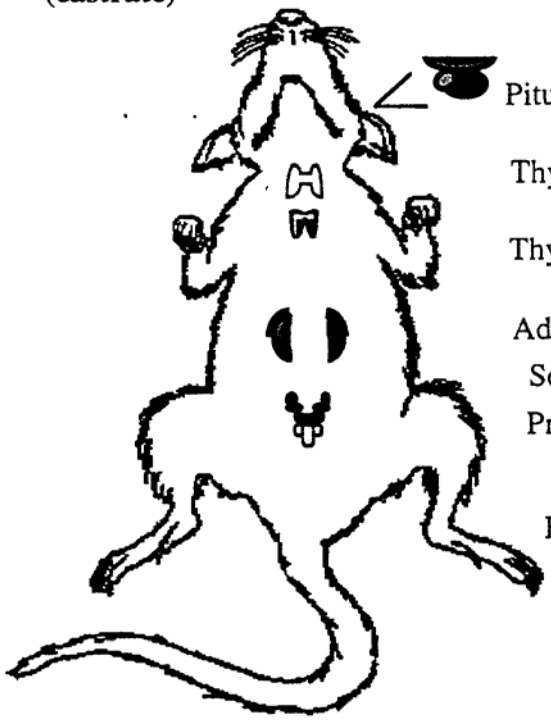


Pituitary: 25 mg

Thyroid: 490 mg
Thymus: 462 mg

Adrenals: 39 mg
Seminal vesicles: 480 mg
Prostate: 400 mg
Testes: 1650 mg
Body weight: 160 g

Hormone 4
(castrate)



Pituitary: 25.7 mg

Thyroid: 495 mg

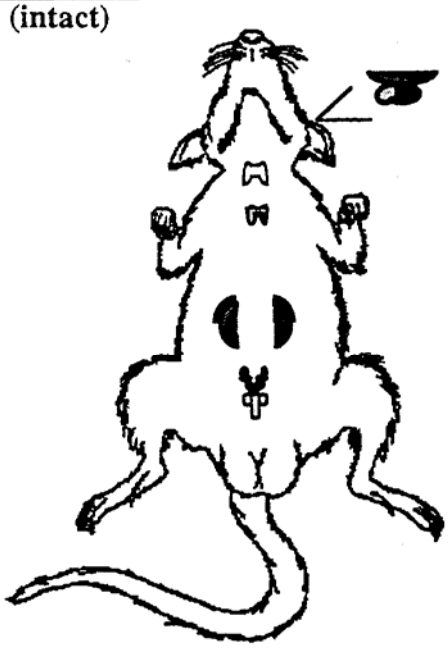
Thymus: 460 mg

Adrenals: 38 mg
Seminal vesicles: 450 mg
Prostate: 375 mg

Body wt.: 144 g

Determine the identity of hormone 5 using the data from the autopsy listed below.

Hormone 5
(intact)

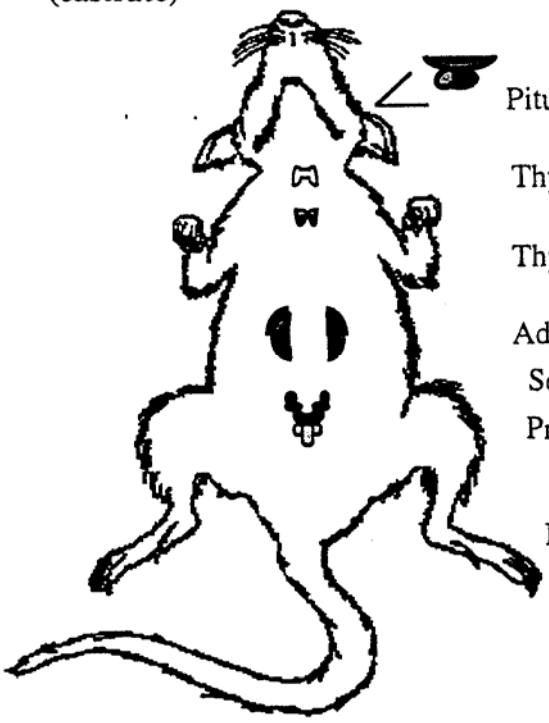


Pituitary: 13 mg

Thyroid: 245 mg
Thymus: 250 mg

Adrenals: 35 mg
Seminal vesicles: 475 mg
Prostate: 410 mg
Testes: 3200 mg
Body weight: 150 g

Hormone 5
(castrate)



Pituitary: 12.9 mg

Thyroid: 247 mg

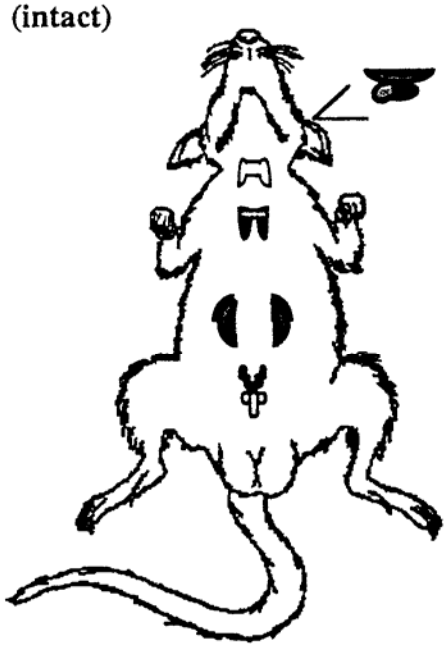
Thymus: 240 mg

Adrenals: 35 mg
Seminal vesicles: 440 mg
Prostate: 380 mg

Body wt.: 135 g

Determine the identity of hormone 6 using the data from the autopsy listed below.

Hormone 6
(intact)

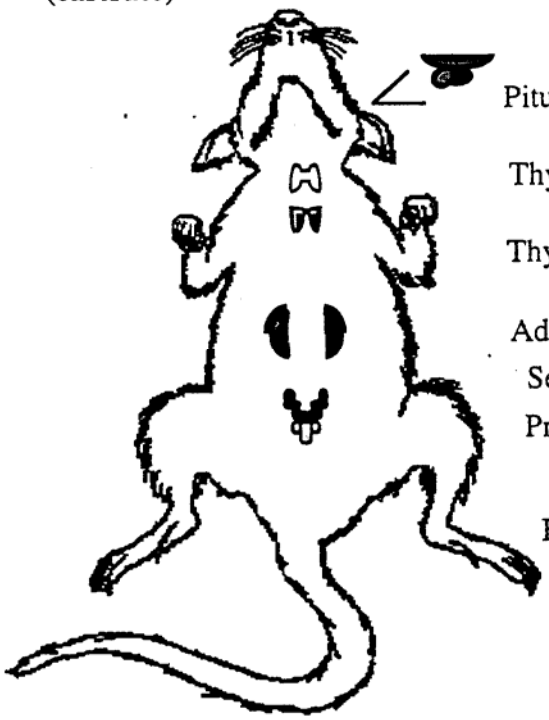


Pituitary: 8 mg

Thyroid: 500 mg
Thymus: 455 mg

Adrenals: 37 mg
Seminal vesicles: 480 mg
Prostate: 405 mg
Testes: 1600 mg
Body weight: 152 g

Hormone 6
(castrate)



Pituitary: 7.8 mg

Thyroid: 505 mg

Thymus: 461 mg

Adrenals: 37 mg
Seminal vesicles: 445 mg
Prostate: 375 mg

Body wt.: 135 g