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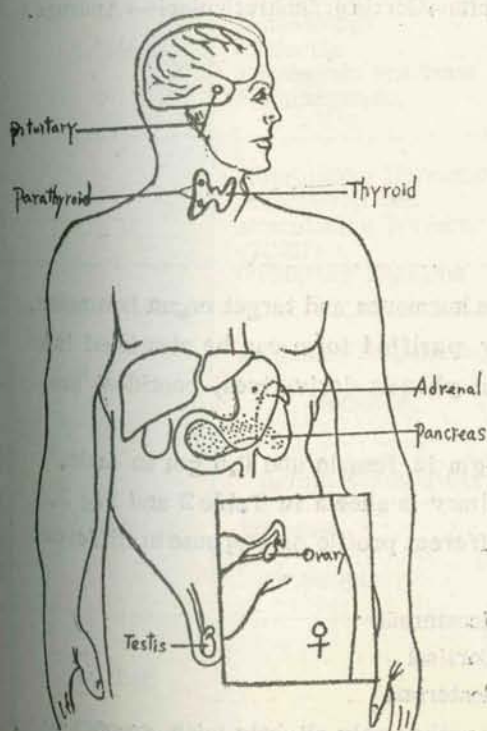


Fig 1

The approximate location of the main endocrine gland

Hormones are chemical messengers produced by endocrine glands, whose secretions are liberated directly into the blood stream and transported to a distant part or parts, where they exert a specific effect for the benefit of the body as a whole. The function of hormone-producing gland or endocrine glands is under the supervision of the pituitary which is known as the "Master gland" or the "Conductor of hormonal orchestra". The approximate location of the main endocrine gland is shown in Fig 1.

Table 1 Chemical Classification of Main Human Hormones

I Protein or Peptide

Pituitary Hormones

Posterior lobe: oxytocin, vasopressin

Intermediate lobe: α -MSH, β -MSH

Anterior lobe: GH, LTH, LH, FSH, TSH, ACTH, Lipotropin

Pancreatic Hormones

α Cell $\rightarrow$ Glucagon, β -Cell $\rightarrow$ Insulin

II Phenol derivatives

Thyroid Hormone

Thyroxin(T_4), 3,5,3' Triiodothyronine(T_3)

Adrenal medullar Hormones

Catecholamines: Norepinephrine, Epinephrine

III Steroids

Adrenal cortical Hormones

Zona glomerulosa $\rightarrow$ Aldosterone, Zona fasciculata $\rightarrow$ Cortisol, Zonareticularis $\rightarrow$ Androgen

Testicular Hormone

Testosterone(Androgen)

Ovarian Hormones

Estrogen, Progesterone

Hormone can be divided into two group: tropic hormones and target organ hormones. The hormones that have been obtained in highly purified form can be classified into four groups according to their chemical structures: phenols derivatives, peptides, protein and steroids Table 1.

The postpubertal pituitary gland weights 0.7 gm in female and 0.5 gm in male.

The general physiological function of the pituitary is shown in Table 2 and Fig 2.

A hormones from one species may exhibit different profile of response to different animal

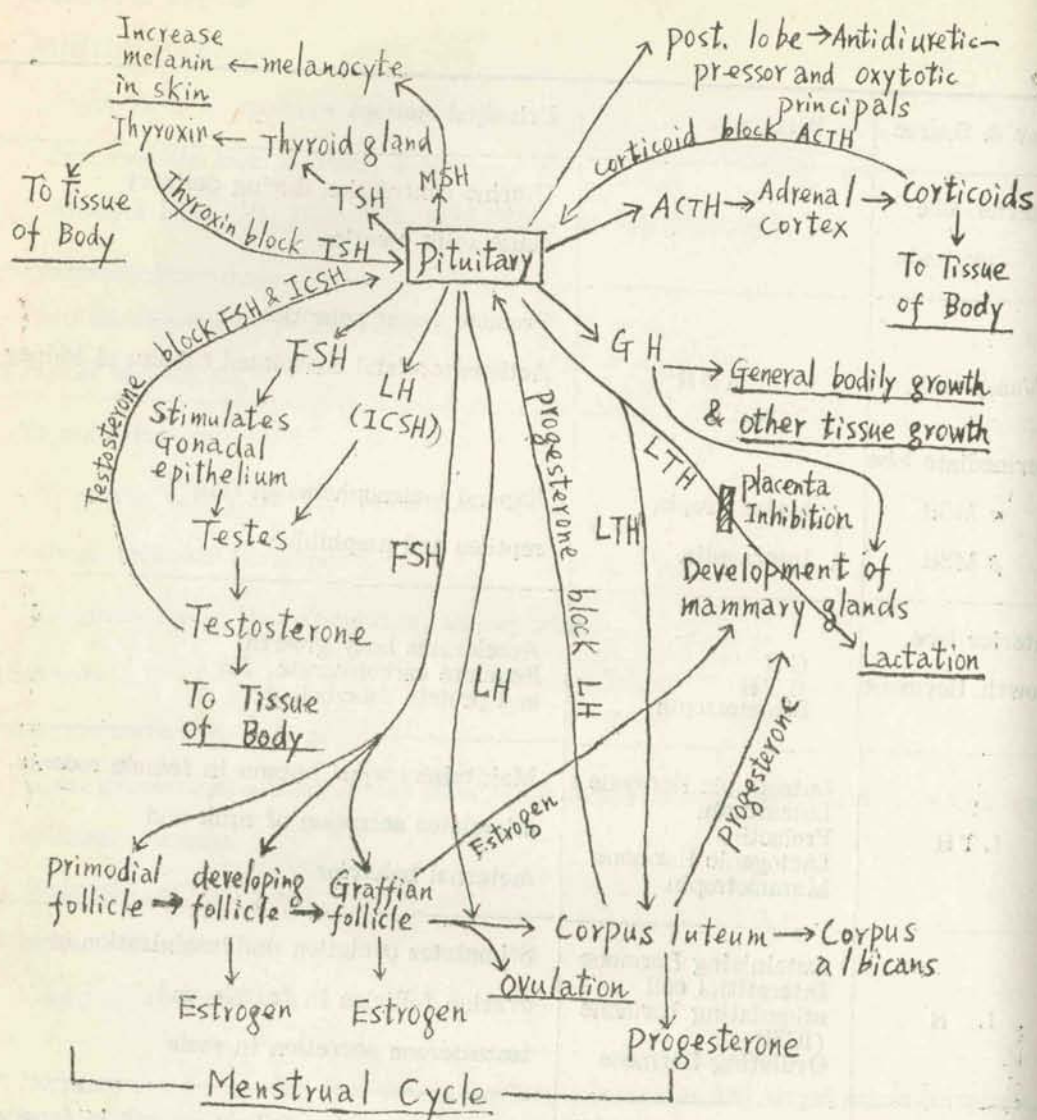
pituitary $\rightarrow$ ACTH $\rightarrow$ Adrenal cortex $\rightarrow$ Rat $\rightarrow$ Corticosterone
 $\rightarrow$ Human $\rightarrow$ Cortisol
 $\rightarrow$ Frog $\rightarrow$ Aldosterone

Hormones which apparently differ one from another only slightly with respect to molecular structure sometimes have vastly different biological effects. There are some examples in Fig 3.

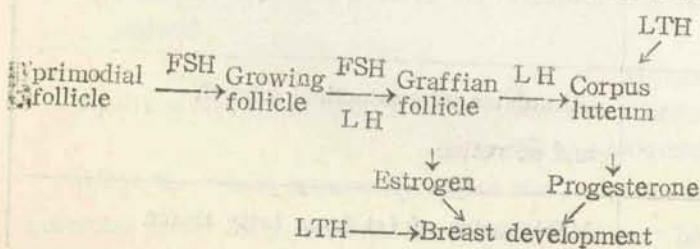
Table 2 General Physiological Function of the Pituitary

Name & Source	Synonyms	Principal Actions
Posterior lobe oxytoxin		Uterine contraction during delivery cause milk ejection
Vasopressin	ADH	Promote water retention Actionsite: distal convoluted tubules of kidney
Intermediate lobe α MSH β MSH	Melanotropin Intermedin	Expand melanophores in fish reptiles and amphibia
Anterior lobe Growth Hormone	GH STH Somatotropin	Accelerates body growth Regulate carbohydrate, fat and protein metabolism
LTH	Luteotropic Hormone Luteotropin Prolactin Lactogenic Hormone Mammotropin	Maintains corpus luteum in female rodents, stimulates secretion of milk and maternal behavior
LH	Luteinizing Hormone Interstitial cell stimulating hormone (ICSH) Ovulating Hormone	Stimulates ovulation and luteinization of ovarian follicles in female and testosterone secretion in male
FSH	Follicular Stimulating Hormone	Stimulates ovarian follicle growth in female and spermatogenesis in male
TSH	Thyroid stimulating hormone Thyrotropin	Stimulate thyroid growth and secretion
ACTH		Stimulates adrenocortical growth and secretion
Lipotropin		Mobilization of fat from fatty tissue

Fig 2 Relationships of the Pituitary Hormones to the Target Gland and Tissues



Pituitary hormones play an important role in ovarian cycle and breast development. The cyclic phenomenon of menstruation is controlled by reciprocal interaction between FSH; LH; LTH and estrogen, progesterone. The growth of the mammary gland (breast) also depends upon a complex interaction of various hormones.



Hormone are growth promoting substances. If an immature animal is deprived of

the pituitary gland the animal ceases to grow or mature. In order to grow, it must be supplied with growth hormone, and for sexual maturation, the gonado-stimulating hormones (gonadotropins) are required. The development of the body is profoundly affected by the thyroid gland. Removal of this gland from a young animal will inhibit growth, delayed bone formation and prevent proper development of the reproductive system. The fact that in both sexes, there is a remarkable acceleration of growth and muscular development during adolescence is well recognized. It seems that the adolescent growth spurt is due to the male sex hormone testosterone. In the female this hormone is secreted from the adrenal glands.

Hormones are concerned in every growth process of specific organ growth and other general body growth. ACTH—→Adrenal cortex, TSH—→Thyroid gland. General body growth is believed to be influenced by (1)pituitary growth hormone (2)Thyroxine, (3)Testosterone.

Cretinism—congenital hypothyroidism (1)Thyroid gland absent or rudimentary (2)Thyroid gland present but defective in hormone secretion; goitrous or secondarily atrophied due to extrinsic factor—deficient iodine, goitrogenic substances? or due to maternal factors. Many cases are familial.

Pituitary gland is by far the most important growth promoting substance in the body. Not only does it exert an influence on general body growth, it also acts as a synergistic agent with other biological active substances in the body. Growth hormone is also important in the function of female sex hormone. It is also called a metabolic hormone influencing carbohydrate, protein and lipid metabolism.

Abnormal function of growth hormone is stated in the following.

True gigantism—Acidophil cell tumors of the anterior pituitary secrete large amounts of the growth hormone. It occurs in children or early teenagers. Excessive growth of hands, feet, jaw and internal organs, delayed closure of epiphyses. Amenorrhea, headaches, visual field loss, sweating, weakness. Elevated serum phosphorus, basal metabolic rate and protein bound iodine are normal, glucosuria. X-ray finding—sellar enlargement and terminal pharyngeal tufting.

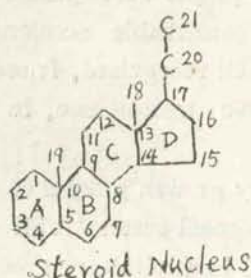
Acromegaly—Acidophil cell tumors of anterior pituitary gland occurs in adult life frequently between 20 to 40 years old. There is enlargement of the hands and feet, prognathism, about 25% of patients have abnormal glucose tolerance tests. A giant can become acromegalic but not vice versa.

Pituitary dwarfism — A condition characterized by retardation of growth and development, resulting from diminished function of anterior pituitary gland with onset during childhood. Because of deficiency of growth and sex stimulating hormones clinical manifestations are acromicria, under-developed sex organs.

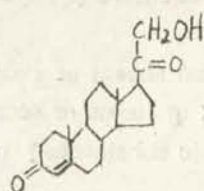
Comparative biochemical aspect of growth hormone. Human growth hormone is different from growth hormone of sheep, swine and ox. These growth hormones isolated from bovine, swine and sheep are no effect on human growth, but ox-growth hormone can promote growth of some species. Growth hormone varies in structure from species to species (Table 3 and 4). Activities of growth hormones in other species shown in Table 4. Human growth hormone contains amino-acid with MW 21,500. Both N-terminal and C-terminal are phenylalanine. There are two -S-S- bridges one across 68-122 position;

one across the former is a long bridge, the later is a short bridge. The model of Human

Fig 3 Different Molecular Structure Have Vastly Different Biological Effect



1

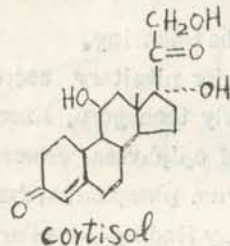


Different site [C₂₁ - CH₂OH]

Action

Sodium Retention

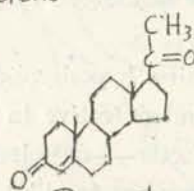
2



Different site [C₁₇ α-OH]

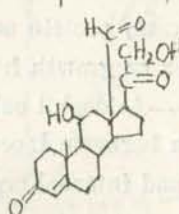
Antiinflammatory action
Antiallergic action

Action Promote glycogen formation



[C₂₁ - CH₃]

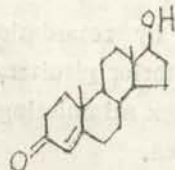
conditioning the uterus for conception and development of fertilized egg



[C₁₈ - CHO (aldehyde)]

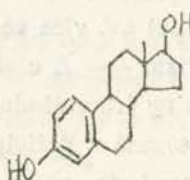
Sodium Retention

3



Different site [A ring]

Action Male Secondary characters



[A ring HO]

Female Secondary characters

Table 3 Some characteristics of various pituitary growth hormones

Properties	Beef	sheep	Humpback Whale	Rhesus Monkey	Human
Molecular Weight	45,000	47,800	39,900	23,000	21,500
Iso-electric Point PH	6.8	6.8	6.2	5.5	4.9
Number of amino acid	389			192	188
Number of -S-S- bridge	4	5	3	4	2
N-Terminal Sequence	Phe-Thr-Ala... Ala-Phe-Ala...	Phe... Ala...	Phe...	Phe...	Phe-Pro-Thr-Leu- Asp-Leu...
C-Terminal Sequence	...LeuAla-Phe -Phe	...Ala-Leu-Phe	...Ala-Leu-Phe	...Aal-Gly-Phe	...Gly-Leu-Phe

Table 4 Activity of growth hormone in various species

Growth Hormone Form	Stimulates Growth In				
	Fish	Birds	Rat	Monkey	Man
Fish	///		+		
Reptiles			+		
Amphibia			+		
Birds		///	+		
Cows	+	-	+	-	-
Sheep	+		+	-	-
Pigs	+	-	+	-	-
Whales			+		-
Monkeys	+		+	///	+
Humans	+		+	+	///

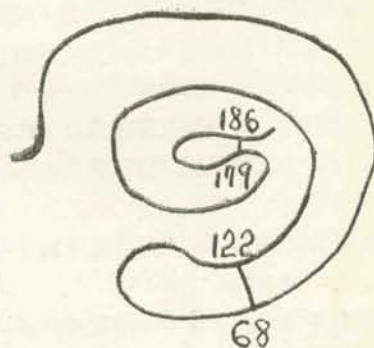
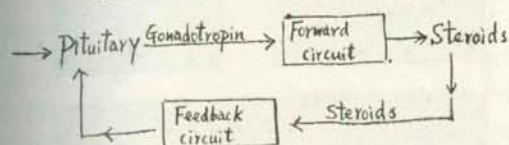


Fig 4 The Model of Human Growth Hormone

Fig 5 Steroids Feedback Mechanism



preserve an internal balance. An example is shown in Fig 5.

Since cancer represents an abnormal process of growth, it is to be expected that hormones play a part in neoplastic development. Hormone can produce cancer but they also can exert an inhibitory effect on tumor growth. Hormone dependent tumors may be prevented by hormonal therapy. The prophylactic method consists of relief of hormonal pressure on the targets of the particular hormonal that is responsible for the tumors. Experimental studies have led to the discovery of hormonal treatment of the prostatic cancer by anti-androgenic agents (female sex hormones). In recent years, surgical removal of the pituitary gland (hypophysectomy) has been introduced as a therapeutic measure for the treatment of breast cancer in human being.

One cannot overemphasize the importance of hormones in the well-being of the body. No stage in individual development from conceptus to senility is exempt from hormonal influence. Hormones are essential factors in the fundamental life processes, and hormones will undoubtedly be among the key substances to furnish us with an eventual understanding of life itself.

growth hormone is shown in Fig 4.

The maintenance of the normal state of the body with respect to the hormonal functioning of the various endocrine glands depends upon a feed-back mechanism, which tends to