PHYSIOLOGY OF MALE REPRODUCTION

THESIS

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For the Master Degree (Urology)

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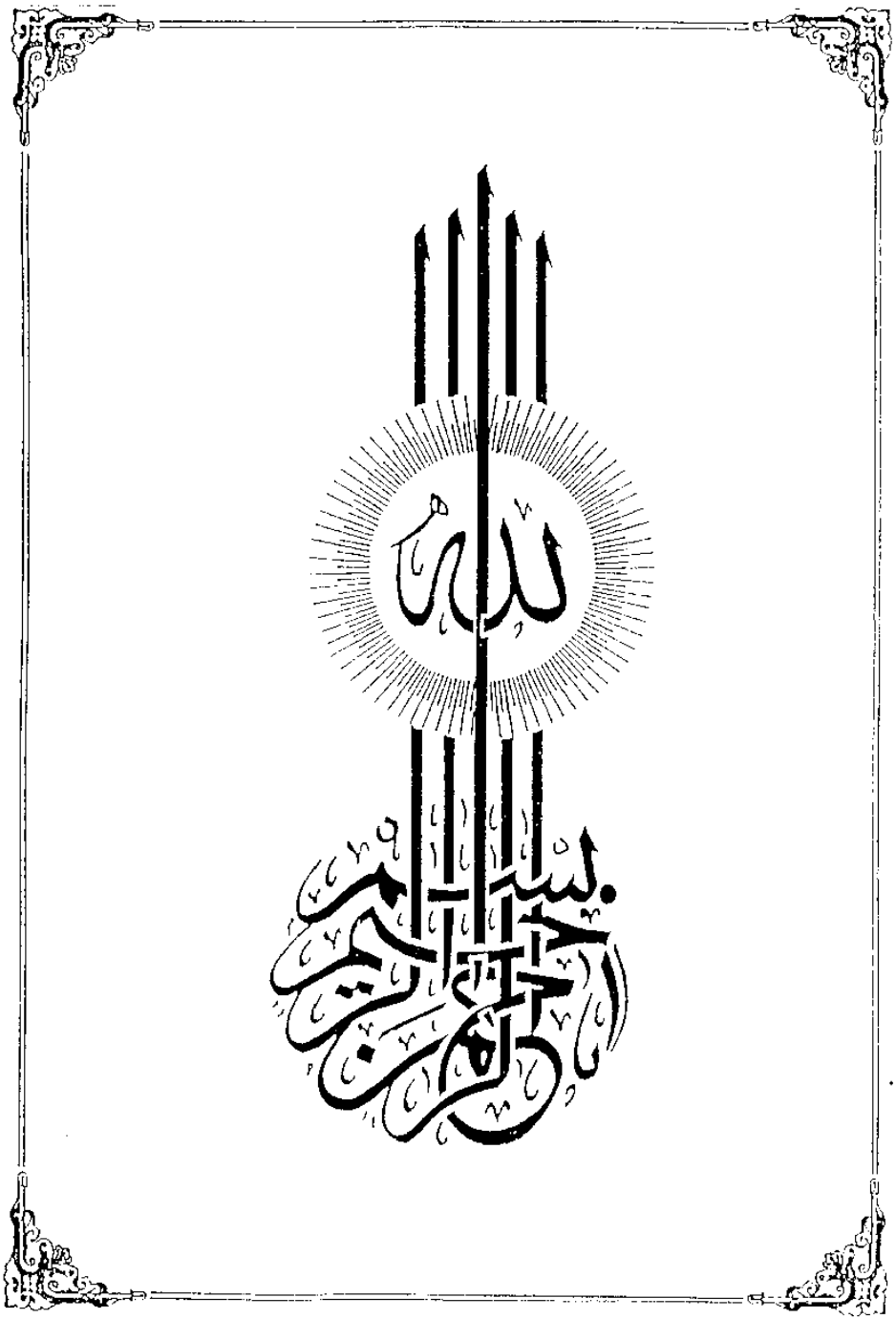

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INTRODUCTION

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The process of reproduction is one of the main functions of all living organisms. Hence, reproduction aims to maintain life and keep species.

Reproduction process varies in different species. In Amoeba, the individual organism multiplies by simple division, while in other species, as in Tinea worm, the individual organism is a hermaphrodite having both male and female reproductive systems.

The human reproduction, as well as in other mammalian, two partners, a male and a female are required for this process to be performed. This work is done to illustrate the basic information necessary to understand normal male reproductive physiology, and rationale for diagnosis and treatment of male infertility.

The physiology of male reproduction includes:

(1) The extrahypothalamic central nervous system.
(2) The hypothalamus.
(3) The pituitary gland and pituitary gonadotropins.
(4) The testis, epididymis, and vas deferens.
(5) The prostate and seminal vesicles.
(6) Sex accessory gland secretion and semen analysis.
(7) Erection, emission, and ejaculation.

The understanding of this reproductive physiology is critical for the assessment of hypogonadism, infertility, abnormal sex organ development (pseudohermaphroditism), delayed and precocious puberty, and may be important in the assessment and management of patients with benign hypertrophy and carcinoma of the prostate.

CHAPTER I

EXTRAHYPOTHALAMIC CENTRAL NERVOUS SYSTEM

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There is ample evidence in experimental animals that xtrahypothalamic brain tissue has both augmentary and nhibitory influences on reproductive function. The sensory ystems of olfaction and vision affect reproductive function n lower animals (Michael, 1975). Blind men do not appear to ave abnormal night-day patterns of blood, LH, FSH, or estosterone (Bodenheimer et al., 1973). Serum testosterone evels are depressed in mentally stressed men (Kreutz et al., 972). The pathways by which extrahypothalamic input reaches he hypothalamus and the role of these signals on the release f gonadotropins require further investigation.

CHAPTER II

HYPOTHALAMUS

THE HYPOTHALAMUS

The hypothalamus is the integrative center of reproductive
:monal axis. Both neural messages from central nervous system
l humoral messages from the testis act to modulate the secre-
)n of hypothalamic gonadotropin-releasing hormones, which are
leased into the hypophyseal-portal vessels that connect the
lian eminence with the adenohypophysis. The hypothalamus
ıtains a large number of nuclei that are responsible for
neostatic control of many endocrine and non-endocrine systems.
anterior and ventral-medial areas of the hypothalamus are
ticularly involved in control of gonadotropin secretion
g. 1).

Biogenic amines secretions from nerve terminals in
othalamus have important influences on the secretion of
einizing hormone-releasing hormone (LHRH).

Noradrenergic input (norepinephrine) augments secretion of
LHRH.

Serotonergic input has inhibitory influences.

Dopamine has very important inhibitory effects.

The well-known effects of reserpine and chlorpromazine
depression of reproductive function are due to their inhibitory
ects on norepinephrine secretion (Sawyer, 1975).

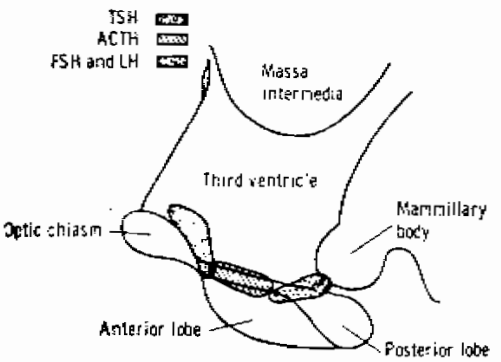

Fig. (1) Areas involved in the control of anterior pituitary secretion in dogs. The sites were determined by the localization of lesions that produced selective blockade of tropic hormone secretion. (Redrawn and reproduced, with permission, from Ganong WF. in *Comparative Endocrinology*. Gorbman A [editor]. Wiley, 1959.)

Gonadotropin-Releasing Hormones

The hypothalamus is the site of production of luteinizing hormone-releasing hormone (LHRH). A separate hypothalamic FSH-releasing factor has not been identified. It is uncertain whether or not there is a separate follicle-stimulating hormone-releasing hormone (FSHRH). The proponents of a single gonadotropin-regulating hormone is referred to LHRH or GnRH.

LHRH is a decapeptide, and has stimulating effects on the pituitary gland that result in enhanced synthesis and release of both LH and FSH (Schally et al., 1971).

At this time, clinically useful measurements of LHRH in systemic blood are not available although many systems have been developed to assay LHRH in body fluids including bioassays and radioimmunoassays.

LHRH, when administered intravenously, acts rapidly resulting in prompt release of LH and, to a much lesser extent, FSH into the blood stream (Wollesen et al., 1976) (Fig. 2).

Testosterone has inhibitory effects on LH and FSH secretion after LHRH administeration, while castration or hypogonadism results in an augmented response (Marshall, 1975).

It was hoped that LHRH testing would distinguish patients with hypogonadotropic hypogogonadism of pituitary origin from those with hypothalamic disease. Unfortunately, some patients with pituitary disease responded to LHRH while some with

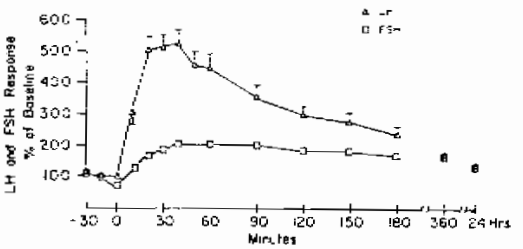

Fig. (2) Serum LH and FSH response to a 300 μg bolus dose of LRH in normal men. A peak response of LH is seen at 20 to 40 minutes after injection. (Modified from Wellesen, F., Swerdloff, R. S., and Odell, W. D.: Metabolism 25,845 (1976).