

Recent progress in luteinizing hormone/human chorionic gonadotrophin hormone research

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ABSTRACT: The role of luteinizing hormone (LH) and human chorionic gonadotrophin hormone (hCG) in the regulation of normal reproductive functions in males and females is quite well established. Besides the use of hCG in the development of diagnostic immunoassays, it has been successfully used in the induction of final follicular maturation and ovulation in the assisted reproductive technologies. The basic and clinical research on the nongonadal actions of LH/hCG in the recent years has extended the potential of using these hormones in several clinical indications. Hereby we will analyze the advances in the LH/hCG research (briefly emphasizing the nongonadal research), which has the potential for multiple novel therapies in reproductive and the other areas of medicine.

Key words: luteinizing hormone / human chorionic gonadotrophin / luteinizing/human chorionic gonadotrophin receptor / gonadal and nongonadal effects

Introduction

Hypothalamic gonadotrophin-releasing hormone stimulated the secretion of luteinizing hormone (LH) by the anterior pituitary. Human chorionic gonadotrophin (hCG) is secreted by the placenta (Pierce and Parsons, 1981). Both LH and hCG are heterodimeric glycoprotein hormones belonging to cystine-knot growth factor families possessing the properties of cytokines and chemokines (Lapthorn et al., 1994). hCG is structurally related to LH and both hormones bind to the same LH/choriogonadotrophin receptor (LHCGR). LHCGR belongs to a family of seven-trans membrane spanning G-protein coupled receptors (McFarland et al., 1989; Ascoli et al., 2002). hCG is more potent than LH due to its higher receptor binding affinity and a longer circulatory half-life (Rao, 1979). Chorionic gonadotrophin is produced in primates, equines and in man, whereas LH is present in all species. hCG appears in the circulation around the time of implantation, increases to reach its peak about ninth week of pregnancy and then drops down to about one-tenth of the peak levels and remains there until the end of pregnancy. hCG is believed to be essential for the maintenance of the pregnancy by stimulating progesterone production by the corpus luteum gravidarum, although this concept was challenged by the discoveries of the multiple actions of hCG in nongonadal tissues throughout pregnancy and during labor (Lei and Rao, 2001a, b). hCG has been shown to

stimulate testosterone production of fetal Leydig cells (Huhtaniemi and Pelliniemi, 1992; Huhtaniemi et al., 1977; Apaja et al., 2005). This review will concentrate on the LH/hCG in reproductive biology and general medicine with particular emphasis on nongonadal research.

The majority of the studies on nongonadal LH/hCG receptors were done on human rather than on other species (Rao and Lei, 2007). Although the studies on nongonadal LH/hCG actions led to a greater potential for novel therapeutic uses of hCG/LH than from the studies on the gonadal actions of LH/hCG (for a review, see Rao and Lei, 2007), few studies have been done in transgenic murine models, where physiologic significances of nongonadal LHR expression in reproductive function is questioned (Ahtaiainen et al., 2007; Pakarinen et al., 2005, 2007). We will enclose a brief discussion on some recent studies based on transgenic murine models either overexpressing or showing disrupted genes, including analysis of the pros and cons of LH/hCG actions in nongonadal tissues.

The LH/hCG research on reproductive biology issues

Classical expression of the LHCGR has been well established in the testicular Leydig and ovarian theca, granulosa and luteal cells where

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Recent Progress in Hormone Research P. Michael Conn, 1999 *Recent Progress in Hormone Research* Laurentian Hormone Conference, 1948 **Recent Progress in Hormone Research** E. B. Astwood, 2013-10-22

Recent Progress in Hormone Research Volume 25 presents the proceedings of the 26th meeting of the Laurentian Hormone Conference held in Mont Tremblant Quebec Canada on August 23 29 1968 The book presents papers on reproductive endocrinology i e a model for the regulation of ovulation in the rat comparative aspects of uterine luteal relationships proinsulin i e proinsulin and the biosynthesis of insulin and the secretion of hormones by tumors of nonendocrine origin i e clinical and laboratory studies of ectopic humoral syndromes The text also includes papers on the ultrastructure of the endocrine glands on the thyroid i e studies of the thyroid iodide trap in human on neuroendocrinology i e the mammalian pineal as a neuroendocrine transducer and on steroid hormones i e metabolic events associated with steroid hydroxylation by the adrenal cortex and steroid dynamics under steady state conditions Endocrinologists and people involved in hormone research will find the book invaluable

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Recent Progress in Hormone Research Volume 32 covers the proceedings of the 1975 Laurentian Hormone Conference The book discusses genetic approaches to steroid hormone action the cytochemical bioassay of hormones and crystal structure of steroids The text also describes the gonadotropin releasing hormone and thyrotropin releasing hormone the ontogenesis of pituitary hormones and hypothalamic factors in the human fetus and the etiologies of sexual maturation The epidemiologic studies of diabetes in the Pima Indians and the adrenal cortex and essential hypertension are also considered The book further tackles the testicular control of follicle stimulating hormone secretion and nuclear receptors and the initiation of thyroid hormone action The text then encompasses the receptor function and ion transport in turkey erythrocytes the regulation of adenylate cyclase coupled beta adrenergic receptors and the control of cyclic AMP metabolism in parental and hybrid somatic cells The molecular mechanisms of cyclic AMP action are also looked into Endocrinologists physiologists molecular biologists and biochemists will find the book invaluable

Recent Progress in Hormone Research Astwood, E B, Ed, 1969 *Recent Progress in Hormone Research* Roy O. Greep, 2013-10-22

Recent Progress in Hormone Research Volume 29 covers the proceedings of the 1972 Laurentian Hormone Conference held in Mont Tremblant Province of Quebec Canada on August 27 September 1 1972 The book discusses the studies on sex differentiation in mammals male pseudohermaphroditism in the laboratory Norway rat and androgen metabolism and mechanism of action in male pseudohermaphroditism The text also describes the mechanism of initiation of parturition in the ewe the neurovascular regulation of the anterior hypophysis and microtubules and beta cell secretion The role of microtubules and microfilaments in thyroid secretion the functional and morphological alterations produced in target cells by anti inflammatory steroids and protein kinases are also considered The book further tackles the role of phospholipids in hormone activation of adenylate cyclase the chemistry of growth hormone and the lactogenic

hormones and hormonal regulation of gene expression in mammary cells The text then encompasses the endocrine and metabolic effects of experimental obesity in human the studies on luteinizing hormone and its subunits and chemical studies of luteinizing hormone from human and ovine pituitaries The studies on the structure and function of interstitial cell stimulating hormone are also looked into Recent Progress in Hormone Research James H. Clark, 2013-10-22 Recent Progress in Hormone Research Volume 45 covers the proceedings of the 1988 Laurentian Hormone Conference The book presents papers on the molecular characterization of the glucocorticoid receptor the estrogen regulation of gene transcription and mRNA stability and the molecular and cellular biology of mammalian progesterone receptors The text also includes papers on the molecular basis of regulation of ionic channels by G proteins the role of biologically active follicle stimulating hormone in reproduction and the role of glycosylphosphoinositides in signal transduction Papers on the mechanisms of growth control in normal and malignant breast epithelium the biochemical and structural analysis of the nerve growth factor receptor and the isolation molecular cloning and mechanism of action of parathyroid hormone related protein are also considered The book further tackles the regulation and dysregulation of adipon in obesity and other metabolic states Endocrinologists physiologists biochemists and scientists involved in hormone research will find the book invaluable Recent Progress in Hormone Research C. Wayne Bardin, 2014-05-10 Recent Progress in Hormone Research Volume 48 provides information pertinent to endocrine research dealing with all aspects of biological organization This book covers a variety of topics including differentiation of the embryo development and growth at puberty maintenance of adult well being and aging Organized into 29 chapters this volume begins with an overview of the role of oncogenes in fetal development This text then compares the molecular descriptions of the genes for growth hormone and prolactin receptors to receptors for a variety of other hormones peptide and growth factors Other chapters consider the three dimensional structure of the growth hormone receptor This book discusses as well the conventional and nonconventional uses of human growth hormone with emphasis on the wide availability of protein that is possible only through molecular biology The final chapter deals with the effect of hormones on primate behavior This book is a valuable resource for geneticists and biologists

Recent Progress in Hormone Research Gregory Pincus, 2013-10-22 Recent Progress in Hormone Research Volume IV is a collection of papers delivered at the 1948 Laurentian Hormone Conference held at Franconia New Hampshire This volume is composed of four parts encompassing 16 chapters that cover experimental works on the role of hormones in metabolism and the thyroid physiology and function The opening part deals with some aspects of steroid hormone metabolism including progesterone estrogen and androgen This part emphasizes the clinical aspects of physiology and function of ovarian hormones The subsequent part is devoted to the role of hormones in tissue and body metabolism This part particularly describes the antihormone problem in endocrine therapy and the alterations in metabolism incident to administration of insulin adrenalin and thyroid substances The metabolic changes under adrenal and pituitary hormone administration are also

examined These topics are followed by discussions on the neurohumoral hypothalamic relationships specifically the adrenal function in mental disease and effects of hypothalamic lesions on water and energy metabolism The final part covers the conditions influencing the production and release of thyroid stimulating hormone by the anterior pituitary the primary actions of the hormone on its target gland a possible mode of action and the factors that influence this hormone's action on the thyroid This book will prove useful to endocrinologists

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Recent Progress in Hormone Research - Volume 50 C. Wayne Bardin, 2013-10-22 Recent Progress in Hormone Research Volume 50 Proceedings of the 1993 Laurentian Hormone Conference focuses on the advancements of processes methodologies

techniques and approaches involved in hormone research The selection first offers information on the molecular design of the NMDA receptor channel synthesis and signaling of growth hormone releasing hormone and signaling mechanisms during the response of pituitary gonadotropes to GnRH The discussions focus on calcium economy of gonadotropes role of oscillations structure and expression of the GHRH gene transgenic animal models for GHRH action and functional determinants in NMDA receptors The text then elaborates on signaling mechanisms during the response of pituitary gonadotropes to GnRH molecular genetic analysis of cAMP and glucocorticoid signaling in development and activins and the receptor serine kinase superfamily The publication takes a look at MAP kinase cascade expression and signal transduction pathways of gonadotropin releasing hormone receptors ovarian cell differentiation and the role of oxytocin and its receptor in parturition The book also examines the role of prolactin in developmental differentiation of hypophysiotropic tuberoinfundibular dopaminergic neurons and calcitonin gene expression in rat uterus during pregnancy The selection is a valuable source of data for researchers interested in hormone research Neuroendocrinology Transmembrane signaling Reproduction Steroids and the steroid receptor family Hypertension

Recent Progress in Hormone Research Roy O. Greep, 2013-10-22 Recent Progress in Hormone Research Volume 41 covers the proceedings of a Laurentian Hormone Conference held in late August 1984 at the Homestead in Hot Springs Virginia The book presents papers on the hormone receptor interactions the biosynthesis secretion metabolism and mechanism of action of the steroid hormones and the mechanisms of action of thyroid stimulating hormone TSH and TRH The text also includes papers on the molecular characterization of a brain specific mRNA and the factors affecting changes in frequency and amplitude of GnRH pulses and the resulting functional consequences in various mammals including humans with disorders of fertility Papers on the biological heritage of mammalian endocrinology such as the actions of urotensin I in mammals and fishes and the clinical implications of the glycosylation and posttranslational processing of the TSH are also encompassed Endocrinologists neuroscientists biochemists biophysicists and scientists involved in hormone research will find the book invaluable

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surveys the biological effects of steroid analogs with a particular emphasis on the relation between hormone structure and function The remaining chapters consider the problem of aldosterone and ecdysone mode of action as well as hormones in fetal life Endocrinologists and biologists will find this book rewarding Recent Progress in Hormone Research Gregory Pincus,1954 Recent Progress in Hormone Research Gregory Pincus,1985

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Table of Contents Recent Progreb In Hormone Research

1. Understanding the eBook Recent Progreb In Hormone Research
 - The Rise of Digital Reading Recent Progreb In Hormone Research
 - Advantages of eBooks Over Traditional Books
2. Identifying Recent Progreb In Hormone Research
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Recent Progreb In Hormone Research
 - User-Friendly Interface
4. Exploring eBook Recommendations from Recent Progreb In Hormone Research
 - Personalized Recommendations
 - Recent Progreb In Hormone Research User Reviews and Ratings
 - Recent Progreb In Hormone Research and Bestseller Lists
5. Accessing Recent Progreb In Hormone Research Free and Paid eBooks
 - Recent Progreb In Hormone Research Public Domain eBooks
 - Recent Progreb In Hormone Research eBook Subscription Services
 - Recent Progreb In Hormone Research Budget-Friendly Options

6. Navigating Recent Progreb In Hormone Research eBook Formats
 - ePub, PDF, MOBI, and More
 - Recent Progreb In Hormone Research Compatibility with Devices
 - Recent Progreb In Hormone Research Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Recent Progreb In Hormone Research
 - Highlighting and Note-Taking Recent Progreb In Hormone Research
 - Interactive Elements Recent Progreb In Hormone Research
8. Staying Engaged with Recent Progreb In Hormone Research
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Recent Progreb In Hormone Research
9. Balancing eBooks and Physical Books Recent Progreb In Hormone Research
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Recent Progreb In Hormone Research
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Recent Progreb In Hormone Research
 - Setting Reading Goals Recent Progreb In Hormone Research
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Recent Progreb In Hormone Research
 - Fact-Checking eBook Content of Recent Progreb In Hormone Research
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements

- Interactive and Gamified eBooks

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