

## VOLUME I

### PART 1 PRINCIPLES OF ENDOCRINOLOGY AND HORMONE SIGNALING 1

1 Principles of Endocrinology.....	3
J. Larry Jameson	
2 Control of Hormone Gene Expression .....	16
Maria K. Herndon, Christine Campion Quirk, and John H. Nilson	
3 Control of Hormone Secretion .....	30
Thomas F.J. Martin	
4 Applications of Genetics in Endocrinology.....	41
J. Larry Jameson and Peter Kopp	

### PART 2 NEUROENDOCRINOLOGY AND PITUITARY DISEASE 69

5 Development of the Pituitary.....	71
Dorota Skowronska-Krawczyk, Kathleen M. Scully, and Michael G. Rosenfeld	
6 Prolactin.....	91
Nelson D. Horseman and Karen A. Gregerson	
7 Disorders of Prolactin Secretion and Prolactinomas .....	104
Marcello D. Bronstein	
8 Adrenocorticotrophic Hormone .....	129
Erika Harro and Anne White	
9 Endocrine Rhythms, the Sleep-Wake Cycle, and Biological Clocks.....	147
Georges Copinschi and Etienne Challet	
10 Hypothalamic Syndromes.....	174
Andrea Giustina and Glenn D. Braunstein	
11 Hypopituitarism and Growth Hormone Deficiency .....	188
Wilton G. Burt and Ken K.Y. Ho	
12 Acromegaly .....	209
Shlomo Melmed	
13 Cushing's Syndrome .....	227
Agata Juszcak, Damian G. Morris, Ashley B. Grossman, and Lynnette K. Nieman	
14 Clinically Nonfunctioning Sellar Masses .....	256
Peter J. Snyder and Shlomo Melmed	
15 TSH-Producing Adenomas .....	266
Paolo Beck-Peccoz, Andrea Lania, and Luca Persani	
16 Pituitary Surgery.....	275
Wenya Linda Bi, Ian F. Dunn, and Edward R. Laws Jr.	

17 Childhood Hypothalamic and Pituitary Tumors.....291  
 Georgia Ntali and Niki Karavitaki

18 Vasopressin, Diabetes Insipidus, and the Syndrome of Inappropriate Antidiuresis .....298  
 Mark J. Hannon and Christopher J. Thompson

19 The Pineal Gland and Melatonin.....312  
 David C. Klein

**PART 3 GROWTH AND MATURATION 323**

20 Growth Hormone: Structure, Function, and Regulation of Secretion .....325  
 John J. Kopchick, Edward O. List, and Lawrence A. Frohman

21 Insulin-Like Growth Factor-1 and Its Binding Proteins.....359  
 David R. Clemmons

22 Somatic Growth and Maturation .....382  
 Leona Cuttler, Madhusmita Misra, and Michaela Koontz

23 Growth Hormone Deficiency in Children .....418  
 Kyriaki S. Alatzoglou and Mehul T. Dattani

24 Performance Enhancing Hormones in Sports Doping .....441  
 David J. Handelsman

**PART 4 OBESITY, ANOREXIA, AND NUTRITION 455**

25 Appetite Regulation and Thermogenesis.....457  
 Eleftheria Maratos-Flier

26 Obesity: The Problem and Its Management.....468  
 Michael A. Cowley, Wendy A. Brown, and Robert V. Considine

27 Bariatric Surgery.....479  
 Su-Ann Ding, Travis McKenzie, Ashley H. Vernon, and Allison B. Goldfine

28 Genetic Syndromes Associated with Obesity .....491  
 I. Sadaf Farooqi and Stephen O'Rahilly

29 Anorexia Nervosa, Bulimia Nervosa, and Other Eating Disorders .....498  
 Irina Kowalska, Monika Karczewska-Kupczewska, Marek Strączkowski, and Robert T. Rubin

**PART 5 DIABETES MELLITUS 515**

30 Development of the Endocrine Pancreas.....517  
 Matthias Hebrok and Michael S. German

31 Biosynthesis, Processing, and Secretion of the Islet Hormones: Insulin, Islet Amyloid Polypeptide (Amylin), Glucagon, Somatostatin, and Pancreatic Polypeptide .....527  
 Donald F. Steiner, Christopher J. Rhodes, Louis H. Philipson, Graeme I. Bell, and Shu Jin Chan

32 Insulin Secretion .....546  
 Juris J. Meier

33 The Mechanisms of Insulin Action .....556  
 Morris F. White and Kyle D. Coppins

34 Glucagon and the Glucagon-Like Peptides .....586  
 Daniel J. Drucker

<b>35</b>	<b>Regulation of Intermediary Metabolism During Fasting and Feeding.....</b>	<b>598</b>
	Ralph A. DeFronzo and Ele Ferrannini	
<b>36</b>	<b>Role of the Adipocyte in Metabolism and Endocrine Function.....</b>	<b>627</b>
	Eric Ravussin and Steven R. Smith	
<b>37</b>	<b>Lipodystrophy Syndromes.....</b>	<b>648</b>
	Michael A. Tsoukas and Christos S. Mantzoros	
<b>38</b>	<b>Classification and Diagnosis of Diabetes Mellitus.....</b>	<b>662</b>
	Michael C. Denny, Robert A. Rizza, and Sean F. Dinneen	
<b>39</b>	<b>Type 1 (Insulin-Dependent) Diabetes Mellitus: Etiology, Pathogenesis, Prediction, and Prevention.....</b>	<b>672</b>
	Ahmed J. Delli and Åke Lernmark	
<b>40</b>	<b>Type 2 Diabetes Mellitus: Etiology, Pathogenesis, and Natural History.....</b>	<b>691</b>
	Christopher J. Hupfeld and Jerrold M. Olefsky	
<b>41</b>	<b>Lipoprotein Metabolism and the Treatment of Lipid Disorders.....</b>	<b>715</b>
	Mason W. Freeman and Geoffrey A. Walford	
<b>42</b>	<b>Hyperglycemia Secondary to Nondiabetic Conditions and Therapies.....</b>	<b>737</b>
	Harold E. Lebovitz	
<b>43</b>	<b>Metabolic Syndrome.....</b>	<b>752</b>
	Neil B. Ruderman and Gerald I. Shulman	
<b>44</b>	<b>Treatment of Type 1 Diabetes Mellitus in Adults.....</b>	<b>770</b>
	Ravi Retnakaran and Bernard Zinman	
<b>45</b>	<b>Diabetes Mellitus and Pregnancy.....</b>	<b>788</b>
	Boyd E. Metzger	
<b>46</b>	<b>Hyperglycemic Crises: Diabetic Ketoacidosis and Hyperglycemic Hyperosmolar State.....</b>	<b>805</b>
	Francisco J. Pasquel and Guillermo E. Umpierrez	
<b>47</b>	<b>Hypoglycemia and Hypoglycemic Syndromes.....</b>	<b>816</b>
	Stephen N. Davis, Elizabeth M. Lamos, and Lisa M. Younk	
<b>48</b>	<b>Management of Type 2 Diabetes Mellitus.....</b>	<b>839</b>
	Kathleen M. Dungan	
<b>49</b>	<b>Management of Diabetes in Children.....</b>	<b>854</b>
	Joseph I. Wolfsdorf and Katharine C. Garvey	
<b>50</b>	<b>Beta Cell Transplantation and Regeneration.....</b>	<b>883</b>
	Gordon C. Weir and Jason L. Gaglia	
<b>51</b>	<b>Diabetes and Long-Term Complications.....</b>	<b>898</b>
	Enrico Cagliero	
<b>52</b>	<b>Diabetic Eye Disease.....</b>	<b>907</b>
	Lloyd Paul Aiello, Paolo Silva, Jerry D. Cavallerano, and Ronald Klein	
<b>53</b>	<b>Diabetes Mellitus: Neuropathy.....</b>	<b>920</b>
	Andrew J.M. Boulton and Rayaz A. Malik	
<b>54</b>	<b>Diabetic Nephropathy.....</b>	<b>934</b>
	Maria Luiza Avancini Caramori and Peter Rossing	
<b>55</b>	<b>Diabetic Foot and Vascular Complications.....</b>	<b>958</b>
	Jeffrey Kalish and Frank B. Pomposelli Jr.	

## PART 6 PARATHYROID GLAND, CALCIOTROPIC HORMONES, AND BONE METABOLISM 967

- 56 Parathyroid Hormone and the Parathyroid Hormone Receptor Type 1 in the Regulation of Calcium and Phosphate Homeostasis and Bone Metabolism .....969  
Thomas J. Gardella, Harald Jüppner, Edward M. Brown, Henry M. Kronenberg, and John T. Potts Jr.
- 57 Parathyroid Hormone-Related Protein .....991  
John J. Wysolmerski
- 58 Calcitonin .....1004  
David M. Findlay, Patrick M. Sexton, and T. John Martin
- 59 Vitamin D: From Photosynthesis, Metabolism, and Action to Clinical Applications .....1018  
Roger Bouillon
- 60 Bone Development and Remodeling .....1038  
Christa Maes and Henry M. Kronenberg
- 61 Regulation of Calcium Homeostasis and Genetic Disorders that Affect Calcium Metabolism .....1063  
Rajesh V. Thakker, F. Richard Bringhurst, and Harald Jüppner
- 62 Genetic Disorders of Phosphate Homeostasis .....1090  
Kenneth E. White, F. Richard Bringhurst, and Michael J. Econs
- 63 Primary Hyperparathyroidism .....1105  
Shonni J. Silverberg and John P. Bilezikian
- 64 Hypercalcemia of Malignancy .....1125  
Karena L. Swan and John J. Wysolmerski
- 65 Surgical Management of Hyperparathyroidism .....1135  
Glenda G. Callender, Tobias Carling, Emily Christison-Lagay, and Robert Udelsman
- 66 Pseudohypoparathyroidism, Albright's Hereditary Osteodystrophy, and Progressive Osseous Heteroplasia: Disorders Caused by Inactivating *GNAS* Mutations .....1147  
Murat Bastepe and Harald Jüppner
- 67 Genetic Defects in Vitamin D Metabolism and Action .....1160  
René St-Arnaud, Glenville Jones, and Francis H. Glorieux
- 68 Hereditary Disorders of the Skeleton .....1173  
Michael P. Whyte
- 69 Osteoporosis .....1184  
Roland D. Chapurlat and Harry K. Genant
- 70 Chronic Kidney Disease Mineral and Bone Disorder .....1214  
Katherine Wesseling Perry and Isidro B. Salusky
- 71 Disorders of Mineralization .....1230  
Marie B. Demay and Stephen M. Krane
- 72 Paget's Disease of Bone .....1244  
Frederick R. Singer

## VOLUME II

## PART 7 THYROID 1255

- 73 Anatomy and Development of the Thyroid .....1257  
Mario De Felice and Roberto Di Lauro
- 74 Thyroid-Stimulating Hormone: Physiology and Secretion .....1278  
David F. Gordon and E. Chester Ridgway
- 75 Thyroid Regulatory Factors.....1297  
Jacques E. Dumont, Carine Maenhaut, Daniel Christophe, and Pierre P. Roger
- 76 Thyroid Hormone Metabolism and Transport .....1322  
Donald L. St. Germain and Arturo Hernandez
- 77 Thyroid Hormone Action.....1336  
Fredric E. Wondisford
- 78 Thyroid Function Testing.....1350  
Roy E. Weiss and Samuel Refetoff
- 79 Thyroid Imaging.....1399  
Manfred Blum
- 80 Thyroid Fine-Needle Aspiration and Cytological Diagnosis .....1417  
Matthew T. Olson and Martha A. Zeiger
- 81 Autoimmune Thyroid Disease .....1423  
Anthony P. Weetman
- 82 Graves' Disease .....1437  
Michele Marino, Paolo Vitti, and Luca Chiovato
- 83 Graves' Ophthalmopathy .....1465  
Henry B. Burch and Rebecca S. Bahn
- 84 Diagnosis and Treatment of Thyroid Disease During Pregnancy .....1478  
Erik K. Alexander and Susan J. Mandel
- 85 Autonomously Functioning Thyroid Nodules and Other Causes  
of Thyrotoxicosis .....1500  
Peter Kopp
- 86 Chronic (Hashimoto's) Thyroiditis.....1515  
Nobuyuki Amino, John H. Lazarus, and Leslie J. De Groot
- 87 Subacute and Riedel's Thyroiditis.....1528  
Valeria C. Guimarães
- 88 Hypothyroidism and Myxedema Coma.....1540  
Wilmar M. Wiersinga
- 89 Nonthyroidal Illness Syndrome: A Form of Hypothyroidism.....1557  
Leslie J. De Groot
- 90 Multinodular Goiter.....1570  
Laszlo Hegedüs, Ralf Paschke, Knut Krohn, and Steen J. Bonnema
- 91 Iodine-Deficiency Disorders.....1584  
Geraldo Medeiros-Neto and Ileana G.S. Rubio

- 92 Thyroid Neoplasia**.....1601  
Furio Pacini Sr., Francesco Chiofalo, and Leslie J. De Groot
- 93 Thyroid-Stimulating Hormone Receptor Mutations**.....1629  
Gilbert Vassart and Gunnar Kleinau
- 94 Genetic Defects in Thyroid Hormone Synthesis and Action**.....1638  
Paolo E. Macchia and Gianfranco Fenzi
- 95 Resistance to Thyroid Hormone**.....1648  
Mark Gurnell, Theo J. Visser, Paolo Beck-Peccoz, and V. Krishna Chatterjee
- 96 Surgery of the Thyroid** .....1666  
Edwin L. Kaplan, Peter Angelos, Benjamin C. James, Sapna Nagar, and Raymon H. Grogan

## PART 8 ADRENAL 1693

- 97 The Principles, Enzymes, and Pathways of Human Steroidogenesis**.....1695  
Richard J. Auchus and Walter L. Miller
- 98 Glucocorticoid Receptors, Their Mechanisms of Action, and Glucocorticoid Resistance**.....1717  
John A. Cidlowski, Carl D. Malchoff, and Diana M. Malchoff
- 99 Glucocorticoid Action: Physiology** .....1727  
George P. Chrousos
- 100 Glucocorticoid Therapy**.....1741  
Lloyd Axelrod
- 101 Aldosterone Secretion and Action**.....1756  
Peter J. Fuller and Morag J. Young
- 102 Adrenal Insufficiency** .....1763  
Andreas Barthel, Holger S. Willenberg, Matthias Gruber, and Stefan R. Bornstein
- 103 Adrenal Causes of Cushing's Syndrome**.....1775  
Francesco Cavagnini and Francesca Pecori Giraldi
- 104 Defects of Adrenal Steroidogenesis**.....1810  
Mabel Yau, Ahmed Khattab, Christian Pina, Tony Yuen, Heino F.L. Meyer-Bahlburg, and Maria I. New
- 105 Adrenarche and Adrenopause**.....1833  
Ieuan A. Hughes and V. Krishna Chatterjee
- 106 Adrenal Gland Imaging** .....1841  
Ka Kit Wong, Isaac R. Francis, Hero K. Hussain, Kyung J. Cho, and Milton D. Gross
- 107 Adrenocortical Carcinoma** .....1862  
Bruno Allolio and Martin Fassnacht
- 108 Primary Mineralocorticoid Excess Disorders and Hypertension** .....1871  
Robert M. Carey and Shetal H. Padia
- 109 Mineralocorticoid Deficiency**.....1892  
Paul M. Stewart and Marcus O. Quinkler
- 110 Pheochromocytoma**.....1902  
Karel Pacak, Henri J.L.M. Timmers, and Graeme Eisenhofer
- 111 Adrenal Surgery**.....1931  
Philip W. Smith and John B. Hanks

<b>PART 9</b>	<b>CARDIOVASCULAR ENDOCRINOLOGY</b>	<b>1951</b>
112	Hyponatremia and Hypernatremia.....	1953
	Rosemary Dineen, Mark J. Hannon, and Christopher J. Thompson	
113	Orthostatic Hypotension and Orthostatic Intolerance.....	1965
	Christopher J. Mathias, Valeria Iodice, David A. Low, and Gianluigi Galizia	
<b>PART 10</b>	<b>ENDOCRINE CHANGES IN CRITICALLY ILL PATIENTS</b>	<b>1985</b>
114	Endocrine Aspects of Critical Care Medicine.....	1987
	Greet Van den Berghe	
<b>PART 11</b>	<b>REPRODUCTIVE ENDOCRINOLOGY AND SEXUAL FUNCTION</b>	<b>2001</b>
115	Gonadotropin-Releasing Hormones.....	2003
	Robert P. Millar and Javier A. Tello	
116	Gonadotropins: Regulation of Synthesis and Secretion.....	2023
	Daniel J. Haisenleder and John C. Marshall	
117	Gonadal Peptides: Inhibins, Activins, Follistatin, and Müllerian-Inhibiting Substance (Antimüllerian Hormone).....	2037
	David M. de Kretser, Mark P. Hedger, and Henry G. Burger	
118	Genetic Basis of Gonadal and Genital Development.....	2051
	Valerie A. Arboleda, Charmian A. Quigley, and Eric Vilain	
119	Diagnosis and Treatment of Disorders of Sexual Development.....	2086
	Rodolfo A. Rey and Nathalie Josso	
120	Endocrinology of Sexual Maturation and Puberty.....	2119
	Courtney Anne Finlayson, Dennis M. Styne, and J. Larry Jameson	
121	Precocious Puberty.....	2130
	Nadine G. Haddad and Erica A. Eugster	
122	Delayed Puberty.....	2142
	Nadine G. Haddad and Erica A. Eugster	
123	Sexual Dysfunction.....	2154
	Ronald S. Swerdloff and Christina Wang	
124	The Endocrinology of Sexual Behavior and Gender Identity.....	2163
	Louis J. Gooren	
<b>PART 12</b>	<b>FEMALE REPRODUCTION</b>	<b>2177</b>
125	Folliculogenesis, Ovulation, and Luteogenesis.....	2179
	Marco Conti and R. Jeffrey Chang	
126	Ovarian Hormone Synthesis.....	2192
	Elizabeth A. McGee and Jerome F. Strauss III	
127	Estrogen and Progesterone Action.....	2207
	Nancy L. Weigel and Carolyn L. Smith	

128	Hormonal Control of Breast Development .....	2216
	Jose Russo and Irma H. Russo	
129	The Menstrual Cycle and Disorders of Ovulation .....	2231
	John C. Marshall	
130	Endometriosis.....	2242
	Richard O. Burney and Linda C. Giudice	
131	Uterine Fibroids .....	2255
	Molly B. Moravek and Serdar E. Bulun	
132	Female Infertility: Evaluation and Management .....	2260
	Frank J. Broekmans and Bart C.J.M. Fauser	
133	Hyperandrogenism, Hirsutism, and Polycystic Ovary Syndrome .....	2275
	Robert L. Rosenfield, Randall B. Barnes, and David A. Ehrmann	
134	Contraception .....	2297
	Anna Glasier	
135	Menopause.....	2310
	Malgorzata E. Skaznik-Wikiel, Michael L. Traub, and Nanette Santoro	

## PART 13 MALE REPRODUCTION 2323

136	Spermatogenesis .....	2325
	David M. de Kretser, Kate Loveland, and Moira O'Bryan	
137	Testicular Dysgenesis Syndrome, Cryptorchidism, Hypospadias, and Testicular Tumors .....	2354
	Ewa Rajpert-De Meyts, Katharina M. Main, Jorma Toppari, and Niels E. Skakkebaek	
138	Androgen Physiology, Pharmacology, and Abuse .....	2368
	David J. Handelsman	
139	Androgen Deficiency Disorders .....	2394
	Carolyn A. Allan and Robert I. McLachlan	
140	Gynecomastia.....	2421
	Bradley D. Anawalt	
141	Clinical Management of Male Infertility.....	2431
	Shlomi Barak and H.W. Gordon Baker	
142	Male Contraception .....	2456
	David J. Handelsman	
143	Endocrinology of Benign Prostatic Hyperplasia and Prostate Cancer .....	2467
	Emma K. Beardsley, Mark Frydenberg, and Gail P. Risbridger	

## PART 14 ENDOCRINOLOGY OF PREGNANCY 2485

144	The Endocrinology of Human Pregnancy and Parturition .....	2487
	Roger Smith and Sue Lynn Lau	
145	Fetal and Neonatal Endocrinology .....	2499
	Evelien F. Gevers, Delbert A. Fisher, and Mehul T. Dattani	
146	Hormonal Changes and Endocrine Testing in Pregnancy .....	2530
	Mark E. Molitch	

**PART 15 MULTISYSTEM ENDOCRINE DISORDERS 2547**

**147 Autoimmune Endocrine Disorders.....2549**  
 Berrin Ergun-Longmire and Noel K. Maclaren

**148 Multiple Endocrine Neoplasia Type 1 .....2566**  
 Rajesh V. Thakker

**149 Multiple Endocrine Neoplasia Type 2 and Medullary Thyroid Carcinoma .....2594**  
 Lyndal J. Tacon, Diana L. Learoyd, and Bruce G. Robinson

**150 Neuroendocrine Tumor Syndromes.....2606**  
 Run Yu

**151 Carcinoid Syndrome.....2615**  
 Kjell Öberg

**152 Ectopic Hormone Syndromes .....2628**  
 David W. Ray

**153 Endocrine-Disrupting Chemicals and Human Disease .....2640**  
 Jerrold J. Heindel and R. Thomas Zoeller

**PART 16 ENDOCRINE TESTING 2653**

**154 Endocrine Testing.....2655**  
 Jon Nakamoto

**Index..... I-1**

**Thyroid, 1357**

**Thyroiditis, 1515**

**Subacute Bacterial Thyroiditis, 1520**

**Thyroid Regulatory Factors, 1297**

**Hypothyroidism and Myxedema Cong., 1540**

**Thyroid Illness Syndrome: A Form of Hypothyroidism, 1557**

**Jodine Deficiency Disorders, 1584**

**Thyroid-Stimulating Hormone Receptor Mutations, 1629**

**Genetic Defects in Thyroid Hormone Synthesis and Action, 1638**

**Resistance to Thyroid Hormone, 1648**

**Surgery of the Thyroid, 1666**

**Thyroid Imaging, 1399**

**and Cytological Diagnosis, 1417**

**81 Autoimmune Thyroid Disease, 1473**

**82 Graves' Disease, 1437**

**83 Graves' Ophthalmopathy, 1465**

**84 Diagnosis and Treatment of Thyroid Disease During Pregnancy, 1478**

**85 Autonomously Functioning Thyroid Nodules and Other Causes of Thyrotoxicosis, 1500**