CONTENTS


1

**INTRODUCTION 1**

Introduction 2
Important concepts in endocrine regulation 8
Hormone antagonism and synergy 10
Endocrine disorders 10
Endocrine investigations: general principles 10

2

**RECEPTORS AND HORMONE ACTION 15**

Introduction 16
General characteristics of receptors 16
Types of hormone receptors 17
Receptors that directly activate a protein kinase 21
Hormonal regulation of transcription 22
Disorders of receptor function 26

3

**THE HYPOTHALAMUS AND PITUITARY PART I: THE HYPOTHALAMUS AND POSTERIOR PITUITARY 27**

Introduction 28
Where can I find the hypothalamus and pituitary? 28
Connection between the hypothalamus and pituitary 31
Development of the hypothalamus and pituitary 31
Release of posterior pituitary hormones is part of a neuroendocrine reflex: oxytocin secretion and actions 32
Regulation of vasopressin secretion 33
Disorders of vasopressin secretion and action 35
Other hypothalamic hormones 37

4

**THE HYPOTHALAMUS AND PITUITARY PART II: THE ANTERIOR PITUITARY 39**

Introduction 40
Structure of the anterior pituitary 40
The hormones of the anterior pituitary 41
Regulation of hormone secretion in the anterior pituitary 43
Actions of the anterior pituitary hormones: growth hormone and prolactin 46
Disorders of anterior pituitary function: oversecretion 48
Treatment of acromegaly 49
Disorders of undersecretion of anterior pituitary hormones 50
Tests for hypopituitarism 50

5

**THE ADRENAL GLANDS PART I: THE ADRENAL MEDULLA 53**

Introduction 54
Where to find the adrenal glands 54
Blood supply 54
Nerve supply 55
Embryology of the adrenal gland 55
The adrenal medulla 55
Disorders of the adrenal medulla: phaeochromocytoma 59
Pharmacological uses of hormones of the adrenal medulla 60
Endocrine hypertension 60

6

**THE ADRENAL GLANDS PART II: THE ADRENAL CORTEX 61**

Introduction 62
Structure of the adrenal cortex 62
Hormones produced by the adrenal cortex 62
Regulation of steroid production 66
Transport of steroid hormones in blood 68
Disorders of adrenal steroids 71
Pharmacological uses of glucocorticoids 73

7

**THE THYROID GLAND 75**

Introduction 76
Thyroid anatomy 77
What is a goitre? 77
Blood supply 77
Structure of the thyroid 78
Synthesis of thyroid hormones 78
Iodine 79
Thyroxine and T3: the thyroid hormones in blood 79
Control of thyroid function 81
Cellular action of thyroid hormones 82
Effects of thyroid hormones 82
Disorders of thyroid hormone secretion 83
Causes of thyroid hyposecretion 85
Effects of thyroid hormone insufficiency in adults 86

CONTENTS


8

**HORMONAL CONTROL OF REPRODUCTION PART I: MALE REPRODUCTIVE SYSTEM 89**

Introduction 90
Where are the testes? 90
What are the testes? 91
Testicular blood and nerve supply 93
Spermatogenesis 93
Androgen production 93
Hormonal control of testicular function 94
Transport of testosterone in blood 95
Actions of testosterone 95
Hormone-dependent cancer in men 98
Disorders of male reproduction 98
Therapeutic uses of androgens 99
Abuse of anabolic androgenic steroids 99
Declining sperm counts 100

9

**HORMONAL CONTROL OF REPRODUCTION PART II: FEMALE REPRODUCTIVE SYSTEM 101**

Introduction 102
Structure of the ovary 102
Ovarian hormones 102
Transport and metabolism of oestrogen and progesterone 104
Oestrogens 104
Hormonal regulation of ovarian function 107
Hormone-dependent cancer in women 107
The menstrual cycle 107
Disorders of the menstrual cycle 110
The endocrinology of pregnancy 112

10

**HORMONAL CONTROL OF REPRODUCTION PART III: DEVELOPMENT AND FERTILITY 117**

Introduction 118
Gender determination and differentiation 118
Hormonal control of sexual differentiation 118
Abnormalities of sexual differentiation 119
Hormones during development: puberty and menarche 120
Disorders of puberty 122
Menopause and the climacteric 123
Premature ovarian failure 124
Symptoms of the menopause 124
Hormone replacement therapy 126
Alternative therapies 127
Hormonal control of fertility: contraception 128
Hormonal control of fertility: assisted conception 129

11

**INSULIN AND THE REGULATION OF PLASMA GLUCOSE 131**

Introduction 132
Sources of plasma glucose 132
Glucose in urine 132
Insulin and the response to high blood glucose levels 134
Disorders of blood glucose regulation: diabetes mellitus 138
Gestational diabetes 145
Metabolic syndrome - a growing problem? 145

12

**HORMONAL REGULATION OF PLASMA CALCIUM AND CALCIUM METABOLISM 149**

Introduction 150
Serum calcium 150
The structure, functions, and endocrinology of bone 151
Hormones involved in the regulation of serum calcium 153
Parathyroid hormone 153
Calcitriol: source and activation of vitamin D 155
Effects of other hormones on plasma calcium 158
Disorders of hypercalcaemia 158
Disorders of hypocalcaemia 159
Diseases of bone 160
A brief mention of calcitonin 161
Regulation of serum phosphate 161

13

**MISCELLANEOUS HORMONES 163**

Erythropoietin 164
Immune-endocrine interactions: cytokines and eicosanoids 164
Age-related changes in hormone secretion 166
Melatonin 166
Gut hormones 168
The hormonal control of appetite 169
Multiple organ disorders in endocrinology 171
Regulation of blood pressure and volume 171
The next 100 years of endocrinology 172

Glossary 175
Index 177