Subject Index

ACTH, see Adrenocorticotrophin
Adiposity, see Body mass index
Adolescent friendly health care
  adaptation to patient developmental stage 248
  adult care transition 251
  ethics 251
  overview 245–247
  prospects for study 251, 242
  self image exploration 248
  sexuality exploration 249, 250
  team approach 250
  therapeutic education and adherence 248, 249
Adrenocorticotrophin (ACTH), anorexia nervosa disturbances 158, 159
AN, see Anorexia nervosa
Anastrozole
  familial male-limited precocious puberty management 237
  McCune-Albright syndrome management
    boys 235
    girls 233
ANE syndrome, genetics 80
Animal models, puberty
  early life influences
    clinical relevance 111–114
    kisspeptin system in convergent mechanisms 101–109
    nutritional manipulation
      overnutrition 99, 100
      overview 96, 97
      undernutrition 97–99
      overview 89–91
    prospects for study 109–111
    sex steroid manipulation through environmental exposures
  bisphenol A 94, 95
  diethylstilbesterol 96
  estradiol benzoate 96
  pesticide 94
  phthalates 95
  phytoestrogens 92, 93
  polychlorinated biphenyls 93, 94
  hypothalamic-pituitary-gonadal axis
    maturation 87–89
Anorexia nervosa (AN)
  bone health
    bone mineral density 159, 160
    IGF-1 role 160, 161
    leptin role 160, 161
    miscellaneous hormone function 161
    nutrition effects 160
    sex hormone studies 160
  diagnostic criteria 154, 155
  endocrine disturbances
    hypothalamic-pituitary-adrenal axis 158, 159
    hypothalamic-pituitary-gonadal axis 155, 156
    hypothalamic-pituitary-growth hormone axis 157, 158
    hypothalamic-pituitary-thyroid axis 158
  treatment
    bisphosphonates 163
    IGF-1 replacement 163
    nutrition 162
    physical activity 163
    sex steroid replacement 162, 163
ARC, see Arcuate nucleus
Arcuate nucleus (ARC), gonadotropin-releasing hormone release regulation 2, 3, 7, 8–11, 88
Athletes, see Female athlete triad
Bicalutamide
familial male-limited precocious puberty management 237
McCune-Albright syndrome management in boys 235

Biopsychosocial development
brain 242
puberty timing effects 243–245
stages in adolescence 241, 242

Bisphenol A (BPA), animal models of early exposure effects on puberty 94, 95

Bisphosphonates, anorexia nervosa management 163

Bone mineral density (BMD), see Bone mineral density

Body mass index (BMI), see Body mass index

Body mass index (BMI)
alternative hormonal activity and obesity 127
cancer survivor obesity 71
eyearly nutritional manipulation of puberty in animal models
overnutrition 99, 100
overview 96, 97
undernutrition 97–99
gonadotropin-releasing hormone agonist therapy
monitoring 218, 219
outcomes 222–224

Bone mineral density (BMD)
anorexia nervosa 159, 160
female athlete triad 167, 168

BPA, see Bisphenol A
Breast cancer, risks with gonadotropin-releasing hormone agonist therapy 226

Cancer survivors
gonadal dysfunction 169–171
management 171
obesity 171
pubertal alterations 169

CBX7, female puberty epigenetic regulation 10

Corticotrophin-releasing hormone (CRH), anorexia nervosa disturbances 158, 159

CPP, see Constitutional delay in growth and puberty

CRH, see Corticotrophin-releasing hormone

Cyproterone acetate (CPA)
familial male-limited precocious puberty management 236
McCune-Albright syndrome management in girls 232

DAX1, normosmic idiopathic hypogonadotropic hypogonadism genetics 41
**Subject Index**

- **DCAF17**, Woodhouse-Sakati syndrome genetics 80, 81, 83
- DDT, puberty timing effects 178, 179
- Dehydroepiandrosterone (DHEA), female hypogonadism and hormone replacement therapy 209, 210
- Delayed puberty, see also Constitutional delay in growth and puberty
  - hypogonadotropic hypogonadism, see Congenital hypogonadotropic hypogonadism; Idiopathic hypogonadotropic hypogonadism
- male delayed puberty diagnosis 185–187
  - prospects for study 193
  - treatment constitutional delay in growth and puberty 188–190
  - hypergonadotropic hypogonadism 192, 193
  - idiopathic hypogonadotropic hypogonadism 189–192
  - rationale 187, 188
- DES, see Diethylstilbesterol
- DHEA, see Dehydroepiandrosterone
- Diethylstilbesterol (DES), animal models of early exposure effects on puberty 96
- **DMXL2**, congenital hypogonadotropic hypogonadism genetics 78, 79
- **EAP1**, central precocious puberty studies 62
- EB, see Estradiol benzoate
- EDCs, see Endocrine-disrupting chemicals
- EED, female puberty epigenetic regulation 10, 11
- Endocrine-disrupting chemicals (EDCs), see also specific chemicals
  - animal model studies of early exposures on puberty 102–106
  - clinical relevance 180–182
- Epigenetics
  - clinical evidence in pubertal outcome birthweight studies 136, 138
  - environmental exposures 146, 147
  - gestational diabetes 147
  - gestational weight gain effects 140, 141
  - infancy weight gain studies 137, 138, 140, 141
  - overview 135, 137
  - polycystic ovary syndrome 142
- premarriage effects 139, 141
- small for gestational age 138–140, 144, 146, 147
early life events and puberty timing 25–27
- female puberty regulation
  - clinical relevance 12, 13
  - gonadotropin-releasing hormone expression activation during neuronal maturation 7
  - Kiss1 expression activation
  - preovulatory gonadotropin surge 7
  - puberty initiation 7, 8–11
  - posttranscriptional regulation 11, 12
- gene regulation in puberty 145, 146
- heredity of changes 147, 148
- mechanisms of regulation
  - DNA methylation 4
  - histone modification 4
  - noncoding RNA 4, 5
  - overview 3
- metabolic programming factors 142–144
- Polycomb group and Trithorax group in chromatin posttranslational modification 6
- Estradiol benzoate (EB), animal models of early exposure effects on puberty 96
- Estrogen
  - anorexia nervosa bone health 160
  - replacement therapy 162, 163
  - female hypogonadism and estrogen replacement therapy administration route 200, 201
  - adolescence guidelines 206, 207
  - androgen replacement studies 207–210
  - dosing 201, 202
  - estrogen formulations 199, 200
  - initiation 202–205
  - mid-puberty guidelines 205, 206
  - rationale 198, 199
- Fadrozole, McCune-Albright syndrome management in girls 233
- Familial male-limited precocious puberty (FMPP), clinical features and management 235–238
- Female athlete triad
  - bone health 167, 168
  - eating disorders 166
  - gonadal axis effects 166, 167
overview 166
treatment 168
FEZF1, Kallmann syndrome genetics 40, 41
FGF, see Fibroblast growth factor
Fibroblast growth factor (FGF), Kallmann syndrome genetics 38, 39
FKTN, puberty timing 19
FMPP, see Familial male-limited precocious puberty
Follicle-stimulating hormone (FSH) anorexia nervosa disturbances 155
gonadotropic axis activation 72–75
4H syndrome, genetics 44, 79, 80, 82
FSD1L, puberty timing 19
FSH, see Follicle-stimulating hormone
Fulvestrant, McCune-Albright syndrome management in girls 234
GABRA1, central precocious puberty studies 60
GH, see Growth hormone
Ghrelin anorexia nervosa bone health 161
eye life events and puberty timing 27
GHS, see Gordon Holmes syndrome
GNAS, somatic activating mutations 63–65
GnRH, see Gonadotropin-releasing hormone
Gonadotropin-releasing hormone (GnRH) agonist therapy in sexual precocity adverse events 219
breast cancer risks 226
cessation 219, 220
doses and formulations 217, 218
indications central precocious puberty 215, 216
children after radiation therapy 216
McCune-Albright syndrome management in girls 232
monitoring 218, 219
outcomes body mass index 222–224
first menstruation 220
first spermarche 220, 221
height 221, 222
metabolic syndrome 225
polycystic ovary syndrome 224, 225
pregnancy studies 225, 226
principles 214, 215
analogs for early puberty treatment 29
female puberty regulation 1–3
gonadotropic axis activation 72–75
normosmic idiopathic hypogonadotropic hypogonadism genetics 41, 42, 44
release regulation 2, 3, 43, 88
Gordon Holmes syndrome (GHS), genetics 43, 44, 76, 77, 81, 82
Growth hormone (GH) anorexia nervosa disturbances 155, 157
eye life events and puberty timing 25, 26
HS6ST1, Kallmann syndrome genetics 40
Hypergonadotropic hypogonadism, treatment 19, 192
Hypogonadotropic hypogonadism, see
Congenital hypogonadotropic hypogonadism; Idiopathic hypogonadotropic hypogonadism
Idiopathic hypogonadotropic hypogonadism (IHH), see also Kallmann syndrome; specific syndromes diagnosis 185–187
genes overview 37
gonadotropin-releasing hormone agonist therapy, see Gonadotropin-releasing hormone
normosmic idiopathic hypogonadotropic hypogonadism genetics
DAX1 41
gonadotropin-releasing hormone 41, 42
kisspeptin 42
leptin 41
TAC3 42, 43
Idiopathic hypogonadotropic hypogonadism, treatment 189–192
IGF-1, see Insulin-like growth factor-1
IHH, see Idiopathic hypogonadotropic hypogonadism
Insulin, anorexia nervosa bone health 161
Insulin-like growth factor-1 (IGF-1) anorexia nervosa bone health 160
disturbances 155, 157, 158
replacement therapy 163
eye life events and puberty timing 25, 26
nutritional response 125, 143
KAL1 38
Kallmann syndrome (KS) epidemiology 38
Subject Index 261

Ketoconazole
familial male-limited precocious puberty management 236, 237
McCune-Albright syndrome management in girls 232, 233

Kisspeptin
animal model studies of early interventions endocrine-disrupting chemicals 102–106
nutrition studies 106–109
overview 101, 102
central precocious puberty genetics
KISS1 18, 51–54
KISS1R 18, 51–54
evergetic regulation 145, 146
gonadotropin-releasing hormone release regulation 2, 3, 43, 88
Kiss1 expression activation in female puberty
preovulatory gonadotropin surge 7
puberty initiation 7–11
normosmic idiopathic hypogonadotropic hypogonadism genetics 42

KS, see Kallmann syndrome

Leptin
anorexia nervosa
bone health 160, 161
disturbances 155, 156
central precocious puberty studies 60, 61
early life events and puberty timing 27
normosmic idiopathic hypogonadotropic hypogonadism genetics 41
puberty timing effects 179, 180

Letrozole, McCune-Albright syndrome management in girls 233, 234

LH, see Luteinizing hormone
LHCGR, autonomous gonadal activation 62, 63

LIN28B
central precocious puberty studies 61
female puberty epigenetic regulation 11
puberty timing 19, 128

Luteinizing hormone (LH)
anorexia nervosa disturbances 155
female puberty regulation 2
gonadotropic axis activation 72–75

Martsolf syndrome, genetics 44
MAS, see McCune-Albright syndrome
McCune-Albright syndrome (MAS)
clinical features and management
boys 235
girls 231–235
GNAS somatic activating mutations 63–65
Metabolic syndrome, gonadotropin-releasing hormone agonist therapy outcomes 225
MKRN3, central precocious puberty genetics 18, 54–58, 128

NELL, Kallmann syndrome genetics 40

Neurokinin B (NKB)
central precocious puberty studies 61
gonadotropin-releasing hormone release regulation 43, 88

NKB, see Neurokinin B

Obesity, see Body mass index

Oliver-McFarlane syndrome, genetics 77

OTUD1, Gordon Holmes syndrome genetics 76

Oxandrolone, female hypogonadism and hormone replacement therapy 207–209

PCBs, see Polychlorinated biphenyls

PcG, see Polycomb group

PCOS, see Polycystic ovary syndrome

Peptide YY (PYY), anorexia nervosa bone health 161

Peripheral precocious puberty (PPP), see also McCune-Albright syndrome
differential diagnosis 230, 231
familial male-limited precocious puberty 235–238

Pesticides, animal models of early exposure effects on puberty 94
Phthalates, animal models of early exposure effects on puberty 95
Phytoestrogens, animal models of early exposure effects on puberty 92, 93
PNPLA6, Gordon Holmes syndrome genetics 76, 77, 82
POLR3A, 4H syndrome genetics 79, 80, 82
POLR3B, 4H syndrome genetics 79, 80, 82
Polychlorinated biphenyls (PCBs), animal models of early exposure effects on puberty 93, 94
Polycomb group (PcG) chromatin posttranslational modification 6
female puberty epigenetic regulation 9, 10, 13
gene transcription repression 5, 6
Polycystic ovary syndrome (PCOS) epigenetics 142
gonadotropin-releasing hormone agonist therapy outcomes 224, 225
PPP, see Peripheral precocious puberty
Precocious puberty, see Central precocious puberty; Peripheral precocious puberty
PROK2, Kallmann syndrome genetics 39
Puberty animal models, see Animal models, puberty epigenetic regulation, see Epigenetics
timing, see Timing, puberty
PYY, see Peptide YY
RAB18, Warburg micro syndrome genetics 77
RAB3a, congenital hypogonadotropic hypogonadism genetics 78
RAB3GAP1, Warburg micro syndrome genetics 77, 78
RAB3GAP2, Warburg micro syndrome genetics 77, 78
Rbcn-3α, congenital hypogonadotropic hypogonadism genetics 78, 79
RBM28, ANE syndrome genetics 80, 83
RNF216, Gordon Holmes syndrome genetics 76, 81
Self image exploration in adolescent friendly health care 248
puberty timing effects 243–245
SEMA3, Kallmann syndrome genetics 39
SOX10, Kallmann syndrome genetics 40
Spironolactone, familial male-limited precocious puberty management 237
STUB1, Gordon Holmes syndrome genetics 76, 81
TAC3 central precocious puberty studies 61, 62
normosmic idiopathic hypogonadotropic hypogonadism genetics 42–44
TACR3 central precocious puberty studies 61, 62
normosmic idiopathic hypogonadotropic hypogonadism genetics 42–44
TAL2, puberty timing 19
Tamoxifen, McCune-Albright syndrome management in girls 234
TBC1D20, Warburg micro syndrome genetics 77
Testolactone familial male-limited precocious puberty management 237
McCune-Albright syndrome management in girls 233
Testotoxicosis, see Familial male-limited precocious puberty
Thyroid hormone, anorexia nervosa disturbances 158
Thyroid-stimulating hormone (TSH), anorexia nervosa disturbances 158
Timing, puberty animal models, see Animal models, puberty body size effects
females 21–24, 123, 124
males 24, 25, 124, 125
changes over time indicators 175, 176
mechanisms 176–180
early life events and epigenetics 25–27
genetic influences 127, 128
genetics FKTN 19
FSD1L 19
genome-wide association studies 19–21
LIN28 19
TAL2 19
TMEM38B 19
ZNF462 19
heritability 18
impact on psychosocial development, self image, and sexuality 243–245
obesity effects in childhood 163–165
precocious puberty, see Central precocious puberty
trends 18, 122–124, 175
variability 17
TMEM38B, puberty timing 19
Triflumizole, obesogenic activity 126, 127
Trithorax group (TrxG)
  chromatin posttranslational modification 6
  female puberty epigenetic regulation 9, 10
  Polycomb group antagonism 6
TrxG, see Trithorax group
TSH, see Thyroid-stimulating hormone
TTF1, central precocious puberty studies 62
Turner's syndrome, oxandrolone therapy 209
Warburg micro syndrome, genetics 44, 77
WDR11, Kallmann syndrome genetics 39
Woodhouse-Sakati syndrome (WSS),
  genetics 80, 81, 83
ZNF462, puberty timing 19