

Index

Note: 'mammals' denotes that information on humans together with other mammals is given

- a-*raf* oncogene, effects of testicular fluid 91
- acrosome, 'knobbed' 50
- acrosome reaction 47, 115–18
 - androgen insensitivity 166
 - calcium ions 116–18
 - sperm interactions with oolema 110–11
 - time of 111
 - transmitter release 112–15
 - excitation–secretion coupling 111–12
 - VOCCs 111, 115–16
- active zones (AZs) 113
- activin, proliferation of Sertoli cells 65, 71, 72
- AEGL1 glycoprotein 94
- AKAP-82, and sperm motility 175
- algorithm, evaluation of infertile male for ICSI 176
- amniocentesis 230–1
- androgen insensitivity 166
- andrology
 - future prospects 251–60
 - history 249
 - training of andrologists 259–60
- angiotensin-inhibiting agents 258
- antioxidant therapy 258
- AR *see* acrosome reaction
- assisted fertilization techniques *see* ICSI
- asthenozoospermia 191–205
 - see also* sperm motility
- axonemal defects, causes of asthenozoospermia 203
- azoospermia
 - DAZ gene 170–1, 234
 - obstructive, and age of wife 185
 - testicular sperm extraction (TESE)–ICSI 153
 - treatment 180–7
 - ICSI 180
 - sperm retrieval and ICSI 180–4
- azoospermia factor (AZF) locus 170
- blood–testis barrier 60, 61
- bone morphogenetic proteins (bmp 8a, 8b) 73
- Bruce effect 13
- c-kit, stem cell factor receptor 67–8
- c-*ros* oncogene, effects of testicular fluid 91
- calcium ions
 - control of exocytosis 114–15
 - voltage-operated calcium channels (VOCCs) 111
- calyculin A 96
- cAMP (cyclic AMP), and sperm cell regulation defects 203–4
- CAMPATH1/HE5 glycoprotein 94
- carnitine, marker of epididymal function 89–90
- CASA *see* computer-assisted semen analysis
- cell regulation defects, causes of
 - asthenozoospermia 203–4
- chimpanzee
 - ejaculate 18
 - sperm competition 11
- α -chlorohydrin 202
- chorionic villus sampling 230–1
- chromomycin A₃ (CMA₃), and in situ nick translation 226–7
- chromosomal disorders
 - genetic basis for male infertility 167–76, 184–7, 228
 - karyotyping 213–14
- ciliary neurotrophic factor (CNTF), gonocyte proliferation 70
- clusterin 94
- coelocentesis 231
- comet assay 226
- comparative genomic hybridization (CGH) 225
- computer-assisted semen analysis (CASA) 193, 201, 254
- contraceptive vaccines, recombinant protein expression 225–6
- cryptorchidism
 - incidence of testicular cancer 129
 - Noonan's syndrome 169–70
 - risk factors 130
- cumulus, penetration during fertilization 108
- cystic fibrosis 165–6, 186–7, 229
- cystic fibrosis transmembrane conductance regulator (CTFR) gene 157, 165, 186–7
- PCR screening 162, 233
- DAZ gene, azoospermia 170–1, 234
- deaf-blindness, Usher's syndrome 174
- demographic factors in male infertility 255
- Denmark, semen quality 131
- diagnostics, future prospects 255–6
- diethylstilboestrol exposure effects 138–9
- dihydropyridines, and VOCCs 115
- disintegrins 110
- DNA damage, causes, and reactive oxygen species 226
- DNA sequencing 224
- donor insemination 199, 233
- Down's syndrome 172, 228

- Drosophila*
 coevolution of sexes 21
 DAZ gene sequence (Boulé) 171
 ejaculate 26
 sperm competition 20–1
- Edward's syndrome 228
- egg vestemans, sperm interactions 108–18
- environmental endocrine disrupters 139, 251
- epididymis, human 85–98
 antigenic determinants, maturation antigens 93
 apparent redundancy in sperm maturation 87–90
 freezing of epididymal sperm, implications 183
 morphology and physiology
 caput, cauda and corpus 86–7
 efferent ductules 86–7
 glycoprotein secretion 89–90, 93–4
 obstruction 88
 sperm aspiration (MESA and PESA) 152–3
 sperm maturation function 92–3
 sperm storage
 temperature 41–4, 96–7
see also ICSI
- epididymis, mammal
 abdominal vs. scrotal 24
 calcification 88
 comparative morphology 23, 86–7
 length 86
 comparative physiology 90–2
 glycoprotein secretion 89–90, 93–4
 initial segment 90–1
 reabsorption of testicular fluid 90–2
 sperm maturation 38–9, 92–3
 sperm transit time 44–5, 86
 congenital absence 89
 epididymal fluid 40
 region specificity of secretory products 89
 sperm storage 40–4, 93–7
 temperature 41–4, 96–7
- epididymovasostomy 39, 88
 function of vas following 89–90
- epigenetic factors, fertilization 253–4
- European countries, testicular cancer 129
- European (ESHRE) collaborative study
 CASA 193–5
 ICSI 150
- evolution
 canalization 7–8
 coevolution of sexes in *Drosophila* 21
 historical aspects of thought 3–14
 revolutions in reproductive theory 6–8
Scala Naturae 3–5
 variability and human origins 257–8
- exocytosis, exocytotoxins 114–15
- female tract, anatomy 35–6
- fertilin α and β 110–11
 recombinant protein expression 225
- fertility
 assessment 45–6
 motility measurements 200–1
- prediction by conventional seminology
 198–200
 receptor operator characteristic curves (ROCC) 199
- definitions 137
 species differences 46
- fertilization
 epigenetic factors 253–4
 penetration of cumulus 108
 zona pellucida interactions 109–10
- fertilization antigen-1 110
- fibroblast growth factor-2 (FGF-2), gonocyte proliferation 69–70, 71
- Finland
 measures of fertility 137–8
 semen quality 129, 134, 137–8
- fluorescent in situ hybridization (FISH) 222–3
 check for normality of sex chromosomes 154, 175
 coelocentesis 231
- fluorochromes, chromomycin A₃ 226–7
- follicle-stimulating hormone (FSH)
 control of spermatogenesis 59–60
 Sertoli cell number, effects of exposure to oestrogens 138–9
- fragile X, diagnostic imaging 229
- France, semen quality 133–4
 regional factors 137
- freezing of gametes, epididymal sperm, implications 183
- future prospects
 for andrology 251–60
 diagnostics 255–6
 freezing of gametes, early years of life 256
 training of andrologists 259–60
- β 1–4-galactosyltransferase 110
- gamete intra-fallopian transfer (GIFT) 199
- genetic basis for male infertility 162–76
 chromosomal disorders 167–76, 213–14
 congenital malformations of male tract 130, 152
 mendelian disorders 163–6
 molecular techniques for diagnosis 213–38
 perpetuation in infertility clinics 252–3
- germ cells
 communication via intercellular bridges 72
 interactions with Sertoli cells 62, 67–8
 migration to gonadal ridge 67–8
 receptor c-kit, adhesion to somatic cells 67–8
 glutathione peroxidase, PEA₃ response elements 93–4
- glycerylphosphorylcholine, marker of epididymal function 89–90
- glycoproteins
 secretion in epididymis 89–90, 93–4
 list 94
- GnRH deficiency 170
- gonocytes, development, local factors 69–70
- gorilla
 ejaculate 18, 26
 sperm competition 11
- guinea pig, epididymis, morphology 87
- HE1 glycoprotein 94

- HE5 (CD52) glycoprotein 93, 96
 HIV infections, RT-PCR detection 222
Homo sapiens
 recent African origin 257
 see also evolution
 hormones, control of spermatogenesis 59–60
 human male reproductive health 128–40
 Huntington's disease 229
 HUSI-11/HEA glycoprotein 94
 hyperthermia
 animal models 44
 scrotal radiative loss 44
 hypospadias, risk factors 130
- immobilin 96
 immotile cilia syndrome 163, 165
 in situ hybridization (ISH) 222–3
 in situ nick translation, and chromomycin A3 226–7
 infertile male syndrome (IMS) 166
 infertility, causes
 asthenozoospermia 202–5
 changes in semen quality 251
 congenital absence of vas deferens 88, 162–6
 DNA damage 226, 235, 251
 see also semen quality
 inhibin 65
 insulin-like growth factor (IGF-1), gonocyte proliferation 71
 integrins 110
 Internet, information exchange 256
 intracytoplasmic sperm injection (ICSI) 149–57
 assessment algorithm for evaluation 176
 ejaculate vs. epididymal or testicular sperm 185
 European (ESHRE) collaborative study 150
 failures 151–2
 genetics of infertile men undergoing 184–7
 'ingredients' 155–6
 intrinsic problems 155–7
 laissez-faire attitudes 250–1
 malformation rate 155
 mitochondrial point mutations 229–30, 235–7
 need for full medical examination 259
 randomized controlled trials, metaanalysis 151
 screening recommendations 237–8
 use of spermatids 156
 inversions (chromosomal) 173, 186
- kallikrein 258
 Kallman's syndrome 164–5
 Kartagener's (immotile cilia) syndrome 163, 165
 karyotyping 213–14
 Kearns–Sayre syndrome, mitochondrial point mutations 235–7
 Klinefelter's syndrome 168–9, 237
 and myotonic dystrophy 166
 testicular failure and TESE-ICSI 153–4, 185–6
- leukocytic cell reaction, in bovines 107–8
 Leydig cell–seminiferous tubule interactions 60–2
 luteinizing hormone, control of spermatogenesis 59–60
- mammals
 mating and social structure 35, 46
 ovulation induction 36
 species differences, fertility and semen characteristics 46
 sperm production 36–7
 sperm storage, temperature 41–4, 96–7
 mating systems, mammals 35, 46
 metabolic defects, causes of asthenozoospermia 202
 microsurgical epididymal sperm aspiration (MESA) 152
 milk consumption, testicular cancer 129
 mitochondrial DNA, paternal 236–7
 mitochondrial point mutations 229–30, 235–7
 monogamy and polygamy 257
 müllerian inhibiting substance (MIS) 63, 70, 139
 myotonic dystrophy 166
- NCAM, Sertoli cell–gonocyte adhesions 69
 nerve growth factor (NGF), effect on DNA synthesis 72
 Noonan's syndrome 169–70
 Norway, testicular cancer 128
- oestradiol, gonocyte proliferation 69–70
 oestrogens, male exposure to xenoestrogens 138–9
 okadaic acid 96
 oligozoospermia
 genetics of infertile men undergoing ICSI 184–7
 see also azoospermia; genetics
 oncostatin M, gonocyte proliferation 69–70
 ovulation, mammals, induction 36
- p53* gene and *p53* protein 70
 P95 zona receptor kinase 110
 P-mod-S 59–60
 pampiniform plexus, heat exchange 97
 Patau's syndrome 228
 penis, mammals 24–5
 erection method 46–7
 structure 45–7
 pentoxifylline 205
 Percoll density gradient 195–6
 percutaneous epididymal sperm aspiration (PESA) 152–3
 phosphodiesterase inhibitors 204–5
 platelet-derived growth factor (PDGF), gonocyte proliferation 69–70, 71
 pollutants, possible causes for changes in semen quality 251
 polvinylpyrrolidone 154
 polymerase chain reaction (PCR)
 amplification of DNA 214–22
 fluorescent PCR 218
 long PCR 221, 230
 multiplex PCR 217–18
 nested PCR amplification 216–17
 primer extension amplification (PEP) 220–1
 quantitative PCR 219
 RT-PCR 222
 screening for genetic defects 233
 sequence-tagged site (STS-PCR) 233–5

- Prader–Willi syndrome 170
 preimplantation genetic diagnosis (PGD) 231–2, 238
 prenatal diagnosis 230–2
 presynaptic membrane, active zones (AZs) 113
- rabbit
 semen characteristics 46
 storage of sperm, temperature 43
 reactive oxygen species (ROS)
 antioxidant therapy 258
 causes of DNA damage 226, 235, 258
 reciprocal translocations 173, 186, 228, 237
 recombinant protein expression 225–6
 restriction endonucleases, post-PCR analysis 223–4
 retinoic acid binding protein MEP10 93
 robertsonian translocations 173, 186, 228
 rodents
 fetal testis differentiation 63–4
 gonocyte division 69
 semen characteristics 46
 sperm competition, presence/absence 20
- Scala Naturae* 3–5
 scrotal temperature, and sperm viability 41–4, 96–7
 scrotum, insulation 42–3
 semen analysis
 computer-assisted semen analysis (CASA) 193, 201, 254
 need for full medical examination of patient 259
 UK NEQAS 232
 WHO protocol 192, 232
 semen characteristics 48–51
 ejaculate (mammals)
 species differences 46
 volume vs. body size 25–6
 gel 48
 seminal plasma 47–8
 sperm morphology 49–51
 sperm numbers 49
 volume 48
 see also sperm motility
 semen quality
 congenital absence of vas deferens 88
 contemporary data against 134–6
 contemporary data in favour 133–4
 effects of abstinence 95
 historical evidence for changes
 infertile men 131–2
 meta-analysis 132–3
 normal men 130–1
 possible causes 251
 regional factors 137–8
 Sertoli cells
 blood–testis barrier 60, 61
 effects of exposure to oestrogens 138–9
 germ cell interactions 62, 67–8
 and initiation of testicular differentiation 62–4
 proliferation 64–7
 activin and inhibin 65
 thyroxine 66
 Sertoli cell only syndrome 184
 stem cell factor receptor c-kit 67–8
 sex chromosomes *see* X and Y chromosomes
 sex-linked diseases 228–9
 sexual dimorphism, evolutionary aspects 5–6
 sexual selection
 early views 18
 and sperm competition 18–19
 SF-1 protein 63
 sheep
 semen characteristics 46
 storage of sperm, temperature 43, 96
 single-gene defects 229
 smoking, DNA damage 254
 and reactive oxygen species 226
sox-9 gene, *sox-9* factor 63
 sperm
 antigenic determinants, maturation antigens 93
 DSP (daily sperm production) 27–8
 longevity and survival times, human 95
 mammals 26–7
 maturation antigens 93
 sperm absorption 40
 sperm capacitation 47
 tyrosine phosphorylase marker 108, 203
 sperm competition 10–12, 18–29
 defined 19–20
 female management 12–13
 in humans 27–8
 sperm delivery 45–8
 sperm morphology *see* sperm structure
 sperm motility 49, 191–205
 and AKAP-82 175
 average path velocities (VAP) 197–8
 causes of asthenozoospermia 202–5
 axonemal defects 203
 cell regulation defects 203–4
 metabolic defects 202
 computer-assisted semen analysis (CASA) 193, 201
 definitions of asthenozoospermia 191
 and fertility 197–201
 conventional seminology 198–200
 quantitative motility measurement and CASA 198–200
 measurement
 objectivity 192
 principal parameters 192
 washed sperm preparations 195–7
 WHO protocol 192
 motility analysers 194
 temperature effects 192
 treatment of asthenozoospermia 204–5
 Usher's syndrome 174
 sperm numbers 49
 sperm quality *see* semen quality
 sperm redundancy 8–10
 sperm retrieval, treatment for testicular failure 183–4
 sperm storage 40–4, 93–7
 sperm structure/function 49–51
 assessment of normality 154–5
 axonemal defects 203

- cell regulation defects 203–4
- centrosome abnormalities 152
- changes in female tract 47
- criterion of maturity 39
- cytoplasmic droplet 38–9, 51, 93
- details 38–9
- flagellum, motility changes 96
- metabolic defects 202
- sperm transport, in mammals
 - interactions with egg vestemans 108–18
 - neurotransmitter release 112–15
 - penetration of cumulus 108
 - interactions with oolema 110–11
 - acrosome reaction 111–12, 115–18
 - interactions with zona pellucida 109–10
 - leukocytic cell reaction 107–8
 - male tract 37–8
- sperm transport, in man 38, 105–19
- to fallopian tube 38, 105–8
- spermatogenesis 56–73
 - cycle in mammals 37
 - genes 63, 70
 - growth factors 67–70
 - hormonal control 59–60
 - local control 60–2
 - major features 56–8
 - maturation in epididymis 38–9, 92–3
 - meiotic stages 61
 - minimal in patients with testicular failure 183
 - postmitotic germ cell development 72–3
 - seminiferous cycle 58–9
 - spermatid development stages 57–8
 - spermatogonial proliferation, local factors 70–2
 - threshold phenomenon 183
- spinal and bulbar muscular atrophy (SBMA) 166
- SRY* gene and *SRY* factor 63, 171
- stem cell factor, receptor c-kit, and testis
 - development 67–9
- superoxide dismutase 93–4
- Sweden
 - semen quality 131
 - testicular cancer 129
- Swyer's syndrome 172
- synaptotagmin 114
- temperature, storage of sperm in epididymis
 - 41–4, 96–7
- testicular cancer 128–30
 - and cryptorchidism 129
 - milk consumption 129
- testicular failure 152–4
 - minimal spermatogenesis 183
 - treatment, sperm retrieval and ICSI 152–4, 180–4
- testicular fluid
 - effects on *a-raf* oncogene expression 91
 - reabsorption in epididymis 90–2
- testicular sperm extraction (TESE)-ICSI 153, 182, 233
- testis
 - biopsy techniques 233
 - development, SCFR c-kit 67–9
 - differentiation, initiation, and Sertoli cells 62–4
 - fetal differentiation 63–4
 - mammals
 - abdominal vs. scrotal 23
 - size 22, 37
 - sperm competition/depletion 22–3
 - sperm production 27–8, 36–7
 - seminiferous cycle 58–9
 - seminiferous tubule, blood–testis barrier 60, 61
 - sperm retrieval, treatment for testicular failure 183–4
- testosterone
 - control of spermatogenesis 59–60
 - Sertoli cell function 62
 - spermatid maturation 73
- thyroxine, proliferation of Sertoli cells 66
- tight junctions, blood–testis barrier 60, 61
- training of andrologists 259–60
- transforming growth factor- α (TGF- α), gonocyte
 - proliferation 71
- traumatic auses of infertility 258
- trisomies 228
- TUNEL assay 227
- tyrosine kinase receptor protein, c-*ros* oncogene 91
- tyrosine phosphorylase, marker of sperm
 - capacitation 108, 203
- uniparental disomy (UPD) 170
- USA
 - semen quality 130–1, 134–6
 - testicular cancer 129
- Usher's syndrome, sperm motility 174
- vas deferens
 - congenital absence (CAVD)
 - and cystic fibrosis 162, 165–6
 - and sperm fertility 88
 - congenital malformations 152
 - storage function 94
- voltage-operated calcium channels (VOCCs) 111
 - participation in acrosome reaction 115–16
 - T and L channels 115–16
- X chromosomes
 - check for aneuploidy (FISH) 154–5
 - 46,XX males 171–2
 - 47,XYY syndrome 168, 169, 237
- xenooestrogens, male exposure 138–9
- Y chromosome
 - check for aneuploidy (FISH) 154–5
 - microdeletions 170–1, 184–5, 233–5
 - mosaicism 234
 - PCR screening for genetic defects 233
- zona binding assay (ZBA) 225
- zona pellucida
 - interactions with sperm 109–10
 - ZP1–3 glycoproteins 111, 225