

Index

A

Adipocyte triglyceride lipase (ATGL), 59
Affymetrix GeneChip Rhesus Macaque Genome Array, 196
AMP-activated protein kinase (AMPK)
 activation, 65
 ADP:ATP ratios, 63
 analogues, 64
 bovine corpus luteum, 66
 catalytic and non-catalytic subunit, 63
 energy-consuming processes, 63
 expression, 65
 HSL-mediated hydrolysis, 65
 LH inhibition, 66–67
 LH-stimulated MTOR activity, 66
 luteal progesterone synthesis, 66
 luteolysis, 66
 in ovarian cells, 64
 PGF2 α , 67–69
 pharmacological AMPK activators, 64
 PKA-induced phosphorylation, 65
 steroidogenic pathway, 66
 synthetic allosteric effectors, 63
 Thr-172, 64
Angiogenesis, 168
Angiogenesis-modulating factors, 168
Angiogenesis-related genes, 5–6
Angiopoietin (ANGPT)-1, 193
Angiopoietins (ANGPTs), 166–167
Anti-luteolytic signal, 135
Apoptosis, 126, 173–174
Aromatase (CYP19A1), 38, 45
Aseasonal monoestrous, 134
Assisted reproductive technologies (ARTs), 197
Atresia, 138

Autophagy

 AKT/MTOR signaling pathway, 69
 autophagosomes, 69
 Becn1 expression, 70
 granulosa cells, 69
 intracellular protein kinases, 70
 LC3-II protein, 70
 luteal cells, 70
 lysosomes, 69
 progesterone production, 70
 tissue physiology, 69
 VDAC, 71

B

Basic helix-loop-helix (bHLH), 25
B-cell lymphoma-2 (BCL2), 70, 192
Bcl-2-associated death protein (BAD), 192–193
Beclin-1 (BECN1), 193
3-Beta-hydroxysteroid dehydrogenase
 (β -HSD/HSD3B), 38, 44–45, 85,
 194–195
17-Beta-hydroxysteroid dehydrogenase
 (17β -HSD/HSD17B), 46
Blood cells, 103
Bovine corpus luteum, 99

C

cAMP response element-binding protein
 (CREB), 237
Canine luteal function, 134–135
Canine pregnancy, 138
Carnitine palmitoyltransferase I (CPT1A), 62
Caspase-3, 173

- CDK inhibitors, 119
- Cell proliferation
 blood supply, 28
 blood vessels, 28
 cyclooxygenase-2, 29
 hypoxia, 30
 VEGF, 29
- Cholesterol
 HDL, 39
 LDLs, 39
 lipid droplets, 39
 luteal cell steroidogenesis, 39
 SCP2, 39
 SR-B1 and LDL receptors, 39
 STARD1, 39
 steroidogenesis, 39
 synthesis, 39
 transportation, 39
- Chorionic gonadotropin (CG)
 LH-like hormone, 187
 maternal–fetal function, 188
 menstrual cycle, 187
 structure and production, 188–190
- Claudin 5 (CLDN5), 192
- Connective tissue growth factor (CTGF), 194
- Controlled internal drug release (CIDR), 210
- Corpus luteum (CL)
 in adult females, 183
 angiogenesis, 24
 cervical stimulation, 118
 clinical applications, 197–199
 conceptus, 208, 209
 endocrine gland, 80
 follicular development, 117
 follicular granulosa cells, 24
 formation, 3
 function
 hysterectomy, 138
 lifespan, 184
 in pregnant and nonpregnant dogs, 134
 genes, 239
 hypoxic conditions, 24
 intensity, 3
 knockout/ knock-in mice models, 2
 knockout mouse, 2
 lifespan and steroidogenic capacity, 118
 mammalian physiology, 118
 maternal recognition, 184
 ovulatory follicle, 183
 P4 and E2, 80
 in pigs, 242
 pregnancy, 118
 progesterone, 3, 118
 regression, 184
 survival, 124–125
 tissue remodeling, 3
 transcription, 80
 VEGF receptor, 2
- CPT1A* mRNA expression, 63
- CXCR1, 102
- CXCR2, 102
- Cyclin-dependent kinases (CDKs), 119
- Cyclooxygenase-2 (COX-2), 6, 144, 161
- CYP19arom, 140
- Cytochrome P450 17-alpha-hydroxylase/17, 46
- D**
- Dendritic cells (DCs), 103
- 20 α -Dihydroprogesterone (20 α DHP), 120
- Disintegrin, 123
- Dll4-Notch system, 127
- DNA-binding domain (DBD), 80
- Domestic cat (*Felis catus*)
 laboratory animals, 134
 ovulation, 134
- Domestic dog (*Canis familiaris*), 134
- DuPont Laboratory, 65
- E**
- Early pregnancy
 immune systems, 109–110
 lymphatic vascular system, 108, 109
- ECM remodeling, 171–173
- Embryo implantation, 102
- Endocrine patterns, 136
- Endothelial cell depletion, 102
- Endothelial–immune interface, 167
- Endothelin (ET), 141
- Endothelin-1 (EDN1), 164–166
- Endothelin-converting enzyme 1 (ECE1), 141
- Eosinophils, 104
- Estradiol (E2), 80, 135, 139
- Estradiol receptors (ERs)
 alpha (ER α), 81
 amino acids, 80
 antagonist receptor, 80
 beta (ER β), 81
 human CL, 85
 mRNA and protein, 87
 nongenomic effects, 87–88
 P4 action and production, 87
 PGRA, 80
 PGRB, 80
 PGRC, 81
 PGR mRNA expression, 84
- Estrogen receptor (ER), 120

Estrogen receptor- β (ER β), 119
 Estrogen synthesis, aromatase/CYP19A1, 45–46
 Estrous cycle, 240–241
 Extracellular matrix (ECM), 121, 194

F

Fibroblast growth factor-2, 7–9
 Follicle-stimulating hormone (FSH), 119,
 136, 188
 Follicular vascular seed
 CL development, 4
 follicle–luteal transition, 4
 immuno-neutralization, 4
 LPA, 4
 preovulatory, 4
 vascular initiation points, 4

G

Gamma-activated sequences (GAS), 209
 Gamma secretase inhibitor (DAPT), 127
 Granulocyte-macrophage colony-stimulating
 factor (GM-CSF), 228
 Granulosa cells (GCs), 118
 Green fluorescent protein (GFP)⁺, 100

H

hCG administration, 240–241
 Heat shock proteins (HSPs), 80
 Hormonal mechanisms, 137
 Hormone response element (HRE), 83
 Hormone-sensitive lipase (HSL), 59, 62
 Human chorionic gonadotropin (hCG), 31,
 124, 210, 229
 Human follicular fluid to human umbilical
 vein endothelial cells (HUVECs), 4
 Hypophyseal hormones, 143–144
 Hypoxia, 9, 10
 after ovulation, 28–30
 before ovulation, 26, 27
 cellular responses, 25–26
 luteal formation, 30
 in ovulation, 27, 28
 Hypoxia-inducible factor-1 α (HIF1 α), 141
 Hypoxia-inducible factors (HIFs), 25

I

IFNT-stimulated response elements (ISRE), 209
 Immune cells
 in CL, 100
 luteal function, 99

Immuno-neutralization, 8
 Inflammation-like luteal development, 101
 Innate immune system, 100
 Insulin-like growth factor-1 (IGF1), 13
 Interferon-stimulated gene 15 (ISG15), 209
 Interferon-stimulated gene factor 3 (ISGF3), 209
 Interferon-stimulated genes (ISGs), 209
 Interferon-tau (IFNT)
 expression, 209
 infusion, 214–218
 into uterine vein, 213–214
 ISGs production, 209
 maternal recognition signal, 208
 PGF2 α resistance, 214–218
 type 1, 209
 tyrosine phosphorylation, 209
 Interleukin 8 (IL-8), 9

K

Kisspeptin, 121

L

Lactatio falsa, 139
 Large luteal cells (LLC), 207
 Leydig tumor cell, 61
 LHCG-receptor
 expression, 191
 granulosa cells, 191
 hCG–LHCGR complex, 190
 H-hCG binding, 191
 hLH and hCG, 191
 LH vs. CG signaling pathways, 192
 LH-/CG-stimulated ovulation, 191
 R high-affinity, 191
 rhodopsin, 190
 LH-Induced local factors, 123–124
 LH receptor (LH-R), 119
 Ligand-binding domain (LBD), 80
 Lipid droplets (LDs)
 acetyl-CoA, 63
 adipocytes and preadipocytes, 58
 and mitochondria, 60
 bovine and ovine, 61
 bovine luteal cells, 60
 catecholamine stimulation, 59
 cell signaling, 61
 cholesteryl esters, 59, 61
 ester-rich LDs, 61
 fatty acids, 62
 HEK293 cells, 62
 hormones/metabolic alterations, 61
 HSL, 59

- Lipid droplets (LDs) (*cont.*)
- luteal tissue, 61
 - β -oxidation, 62
 - PLIN coat proteins, 59
 - PLIN family, 58
 - Plin2*-null mice, 59
 - protein composition, 61
 - protein expression and activity, 58
 - proteome, 61
 - rat granulosa cells, 61
 - size and activity, 58
 - StAR, 59
 - steroidogenic tissues, 58, 63
 - storage, 58
- Luteal angiogenesis, 4
- follicular programming (*see* follicular vascular seed)
 - initiation, surge, 4–6
- Luteal cells, 123
- Luteal endothelial cells, 164
- Luteal function
- afore-described pathways, 196
 - CG-regulated luteal mRNAs, 197
 - direct vs. indirect effects, 196
 - estrogen receptor isoform, 195
 - HSD11B1, 196
 - HSD3B2, 195
 - membrane-associated form, 195
 - mid-luteal phase, 195
 - nuclear hormone receptors, 195
 - progesterone production, 194
 - steroid depletion, 197
 - steroid synthesis, 195
 - trilostane-treated animals, 197
- Luteal regression
- canine CL, 138
 - corpora lutea, 138
- Luteal steroidogenic cells, 163, 167
- Luteinization
- cell division, 118–119
 - follicular granulosa, 25
 - and luteal formation, 27
 - molecular factors, 119
 - ovulation, 27
- Luteinizing hormone (LH), 64, 184
- estrogen production, 38
 - follicular maturation, 38
- Luteolysin, 207
- Luteolysis
- amplification, 161
 - angiogenesis, 194
 - ANGPT1, 193
 - apoptosis, 192
 - BAX* mRNA levels, 193
 - binding sites, 141
 - canine CL, 140
 - canine luteal structures, 140
 - CD14⁺ macrophages, 105
 - CD34 and Ki-67 immunostaining, 193
 - CD8- and MHC II-positive immune cells, 143
 - cellular integrity and morphology, 192
 - CL, 160
 - countercurrent system, 161
 - cows and mares, 104
 - CTGF* mRNA levels, 194
 - cytokine C-C motif, 187
 - cytokines, 105
 - definition, 161–162
 - dose–response curve, 187
 - dramatic changes, 161
 - E2 levels, 139
 - early pregnancy, 193, 194
 - endogenous LH pulses, 187
 - endothelial cells, 164
 - extravasated erythrocytes, 142
 - feto-placental level, 140
 - immune cells, 186
 - immunostaining, 192
 - inflammatory cytokines, 104, 105
 - intercellular distances, 142
 - LH-receptor desensitization, 187
 - luteal formation, 139
 - luteinizing theca cells, 140
 - menstrual cycle, 192
 - mid-late luteal phase, 187
 - mid-luteal phase, 192
 - mid-pregnant dogs, 140
 - MMP2 and MMP9 expression, 194
 - mRNA expression, 142
 - neutrophils, 106
 - non-fecund menstrual cycle, 185
 - nonpregnant bitches, 142
 - ovary, 160
 - ovulating follicles, 138
 - P4 concentrations, 139
 - P4 secretion, 141
 - PGF2 α , 139
 - PGF2 α administration, 104
 - PGR blocker, 140
 - phase refractoriness, 162
 - physiological concentration, 160
 - in primates, 186
 - pro-luteotropic to pro-luteolytic factors, 187
 - prostaglandin synthesis, 105
 - pseudo-pregnancy, 160
 - regression, 185
 - regulatory components, 143

- rhesus monkey, 192
 - in ruminants, 207
 - self-destruct mechanism, 186
 - in sheep, 207
 - steroidogenic capacity, 138
 - steroidogenic cell, 141
 - subcellular level, 142
 - substantial variability, 160
 - $\gamma\delta^+$ T cells, 104
 - T lymphocytes, 105
 - ultrastructural level, 192
 - uterine-derived, 104
 - uterus, 160
 - vascularization rates, 142
 - Luteotropic factors, 135
 - Luteotropic mechanisms, 134
 - Lymphatic vascular system, 108, 109
 - Lysophosphatidic acid (LPA), 4
- M**
- M1 vs. M2 macrophages, 108
 - Macrophages, 101–102
 - Maternal recognition of pregnancy, 233–234
 - Mechanistic target of rapamycin (mTOR), 65
 - Membrane progesterin receptor (mPR)
 - hypothetical role, 90–92
 - isoforms, 90
 - nongenomic effects, 90
 - Menstrual cycle
 - luteotropic factors, 184–185
 - structure–function, 184
 - Monocyte chemoattractant protein-1 (MCP-1), 27
 - Monocytes, 101–102
- N**
- N1-type neutrophils, 111
 - Natural killer (NK) cells, 187
 - Neonatal and embryonic PAS (NEPAS), 25
 - Neutrophils, 103
 - IL-8 and PMA, 106
 - inflammatory sites, 106
 - PGF2 α , 106
 - polarization, 106–108
 - T lymphocyte, 106
 - N-formyl-methionyl-leucyl-phenylalanine (fMLP), 106
 - NO donor (NONate), 87
 - Notch
 - apoptosis, 126
 - CYP11A1 (P450scc) synthesis, 125
 - family members, 126
 - inhibition, 125
 - proteins and ligands, 125
 - signaling, 125
 - Notch signaling pathway, 10
- O**
- Occludin (OCLN), 192
 - Ovarian blood flow, 24–25
 - Ovarian cancer, 13, 14
 - Ovarian hyperstimulation syndrome (OHSS), 14, 197
 - Ovynch treatments, 210
 - Oxygen-dependent degradation domain (ODD), 25
 - Oxytocin (OT) level, 85
 - Oxytocin receptor (OXTR), 206
- P**
- P450scc, 43–44
 - P450scc enzyme, 38
 - Pentraxin 3 (PTX3), 11, 12, 168
 - Pericytes (mural cells), 12
 - Perioovulatory endocrine events, 135–138
 - Perioovulatory events, 148–149
 - Peripheral blood mononuclear cells (PBMC), 100, 209
 - PGE2-mediated regulation, 145
 - PGE type 2 receptor (PTGER2), 6
 - PGF2 α , 67–69, 126
 - ABCC4* and *SLCO2A1* mRNA levels, 235
 - carbonyl reductase, 235
 - downstream elements, 238
 - during pregnancy, 211–213
 - luteal function, 234
 - mid-luteal phase, 237
 - mPGES1*, 235
 - mPGES1 expression, 237
 - and PGE2 transporters, 235
 - post-PTGFR signaling pathways, 236, 237
 - production, 135
 - prostaglandin synthesis, 234
 - pseudo-pregnant pigs, 235
 - PTGFR mRNA, 236
 - PTGS2 mRNA, 236
 - RAF1/MAPK1/ERK1/2, 237
 - uterus-delivered PGE2, 237
 - VEGF expression, 238
 - PGF2 α metabolite (PGFM), 151
 - PGF2 α synthase (PTGFS), 228
 - PGRA and PGRB, 84
 - PGRMC1, 88–90
 - PGRMC2, 88–90

- PGR mRNA expression, 84
 PG transporter (PGT), 145
 Phosphoglycerate kinase-1 (PGK-1), 26
 Phosphatidylinositol-3 kinase (PI3K), 124
 Platelet-derived growth factor receptor-B (PDGFRB), 12
 Polarization mechanism, 107
 Polymorphonuclear leukocytes (PMNs), 102, 103
 Porcine
 CL development, 230, 231
 maintenance, 233
 PGF2 α , 234–238
 PGFE2, 234–238
 regression, 231–232
 Postovulatory endocrine patterns
 baseline values, 151
 domestic cat, 151
 E2 levels, 151
 feline pregnancy, 151
 feto-placental unit, 150
 functional CL, 149
 3 β HSD, 150
 hysterectomy, 151
 P4 production, 150
 PGF2 α , 151
 plasma P4, 150
 pseudo-pregnancy, 150
 residual cells, 151
 steroidogenic capacity, 150
 uterus and placenta, 150
 vacuole types, 152
 Pregnancy
 establishment
 antiluteolytic/luteoprotective PGE2, 228
 embryo signals, 228
 endometrial stroma, 228
 immune-related genes, 229
 intrauterine seminal plasma, 229
 lymphatic pathways, 229
 macrophages, 229
 maternal reproductive tract, 228
 in pigs, 228
 semen and embryos, 229
 seminal plasma, 228
 sexual reproduction, 228
 uterine exposure, 228
 uterine parameters, 229
 fertile cycles, 184
 maternal recognition, 184
 resistance, CL, 211–213
 in ruminants, 208
 Pregnenolone, 38, 194
 Prepartum luteolysis, 145–147
 Primate
 functional lifespan, 184
 lifespan, 186
 PRL and PRL receptor, 120
 Progesterone, 1, 111
 cholesterol, 65
 early conceptus survival, 210–211
 luteal cells, 63
 production, 38
 secretion, 61
 steroidogenic cells, 61
 synthesis, 59
 Progesterone exposure
 CL-containing ovary, 206
 hysterectomy, 206
 PGF2 α , 206
 utero-ovarian plexus, 206
 uterus, 206
 Progesterone-producing cells, 162–164
 Progesterone receptor (PGR), 120–121, 185, 207
 hypothetic model, 89
 isoform mRNA, 86
 Pro-inflammatory cytokines, 108
 Prolactin (PRL), 118, 139
 Prostaglandin F2 α (PGF2 α), 160, 207
 blood vessels, 168–171
 Prostaglandins (PGs), 6, 144, 145
 Prostaglandin transporter (PGT), 161
 Protein kinase C (PKC), 207
 Pseudo-pregnancy, 118
 bitches, 147
 canine genital tract, 135
 dogs, 140
 genes, 147
 luteolysis, 138
 nonpregnant cyclic bitches, 135
 PRL levels, 139
 regression, 143
 PTGS2, 144

R
 Recombinant interferon tau (roIFNT), 214, 215
 Regression, 125–127
 macrophages, 104–105
 T Cells, 104–105
 Relaxin, 150, 187, 188, 192
 RESCUE switch, 237

S

- Secreted protein acidic rich in cysteine (SPARC), 9
- Semi-circadian surges, 120
- Seminal plasma, 230
- Signal transduction and activator of transcription (STAT)
 - STAT-1, 209
 - STAT-2, 209
 - STAT-3, 209
 - STAT-5, 209
 - STAT-6, 209
- Smooth muscle actin (SMA), 13
- STAR expression, 66
- STAR production, 148
- STAR-related lipid transfer (START), 39
- StAR/STARD1 regulation
 - AP-1 family member, 43
 - C/EBP-binding sites, 43
 - FOXO1, 43
 - GATA consensus site, 42
 - GATA4 and GATA6, 42
 - gonadotropin, 41
 - KLF factors, 43
 - mammals, 41
 - mRNA, 41, 42
 - NR5A sites, 42
 - PKA, 42
 - protein, 41
 - proximal 5'-flanking DNA, 42
 - SF-1/NR5A1, 42
- Steroid hormone receptors
 - phosphorylation processes, 82
 - regulation, 83–84
 - transcription, 81
- Steroidogenesis
 - and angiogenesis, 27
 - cellular metabolic events, 58
 - corpus luteum, 38
 - genes regulation, 41
 - LDs, 59
 - in luteal cells, 40
 - oxygen supply, 25
 - progesterone, 38
- Steroidogenic acute regulatory protein (STAR), 141, 194
- β -Subunit of LH (LH β), 188

T

- Th2 immunity, 108
- Thrombospondin (THBS), 10, 11
- Thrombospondin-1 (THBS1), 170
- Thrombospondin-like repeats-1 (ADAMTS-1), 123
- Thrombospondins (THBS1, -2), 168
- Thyroid-stimulating hormone (TSH), 188
- Tissue inhibitors of metalloproteinases (TIMPs), 121
- Tissue remodeling, 121–123
- T lymphocytes
 - bovine CL, 100
 - cell division, 100
 - communication tool, 101
 - IL-10 expression, 101
 - immune cells, 100
 - PBMC, 101
- Transcription factors
 - regulation, 47
 - SREBP, 39
 - steroidogenic pathway, 41
- Trophoblast, 189
- Trophoblast protein-1, 208
- Two-cell embryo, 189
- Two signal-switch hypothesis, 238

U

- Uterine histotroph, 210

V

- Vaginal cytology, 139
- Vascular endothelial growth factor (VEGF), 25
- Vascular endothelial growth factor-A (VEGFA), 7–9, 11, 141, 193, 229
- Vascular epithelial growth factor (VEGF), 102, 142
- Vasohibin 1 (VASH1), 11
- VE-cadherin, 12

W

- Wnt/ β -catenin signaling pathway, 124
- Wnt/ β -catenin transduction pathway, 124