

Appendix 4. IPA Core Analysis Results: Physiological Systems Enriched in Term Amniotic Fluid

Category	# total genes	Functions Annotation	BH p-Value	# Genes	Molecules
Immune Cell Trafficking	72	cell movement of neutrophils	0.001	31	AGER, BPIFA1, C3, CD36, CD44, CD74, CFTR, CNN2, CSF1, CXADR, C CXCL2, DEFB1, FOXA2, GJB2, IL1B, IL33, IL6R, IL6ST, IL8, MMP7, NC PLG, PTGER3, PTGS2, SLPI, SMAD3, TGFB2, TLR2, UNC5B
		cell movement of antigen presenting cells	0.005	30	ABCC1, AGER, C3, CCDC88A, CCL22, CD209, CD44, CD74, CNN2, CO CXCL14, CXCL17, DEFB1, DMBT1, EDNRB, IL1B, IL8, LDLR, LRRK2, M PIGR, PLG, PTGS2, SFTP, SMAD3, STC1, TLR2, VEGFA
		activation of antigen presenting cells	0.008	23	AGER, C3, CCL22, CD209, CD74, CHI3L1, CSF1, FOXA2, HLA-DMA, H HLA-DQB1, IL1B, IL33, IL8, KNG1, PLG, PTGER3, PTGS2, RORA, SLPI, VEGFA
		leukocyte migration	0.012	62	ABCC1, AGER, BPIFA1, C3, CCDC88A, CCL22, CD209, CD36, CD44, C CHI3L1, CNN2, COL4A1, COL4A3, CSF1, CXADR, CXCL14, CXCL17, CX CYSLTR1, DEFB1, DMBT1, EDNRB, ESAM, FOXA2, GJB2, HOXA7, IL1B IL6ST, IL8, ITGA3, ITGA9, KITLG, KNG1, LDLR, LRRK2, MMP28, MMP7 NFIC, NFKBIZ, NQO1, PIGR, PLG, PRF1, PTGER3, PTGS2, RORC, SCGE SFTP, SLPI, SMAD3, STC1, TGFB2, TLR2, UNC5B, VDR, VEGFA
		recruitment of antigen presenting cells	0.015	13	CCL22, CD36, CD44, CNN2, CSF1, FOXA2, IL1B, IL8, MMP28, NFIC, P
		influx of neutrophils	0.017	8	CD44, CXCL2, IL6R, IRAK3, LCN2, SFTP, SMAD3, TLR2
		migration of antigen presenting cells	0.018	17	ABCC1, C3, CCL22, CD209, CD44, CD74, CNN2, CSF1, CXCL17, DEFB IL1B, IL8, PIGR, PLG, TLR2, VEGFA
		recruitment of phagocytes	0.022	20	CCL22, CD36, CD44, CHI3L1, CNN2, CSF1, CXCL2, FOXA2, IL1B, IL33 MMP28, MUC1, NFIC, PLG, SLPI, SMAD3, TLR2, VDR

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		activation of granulocytes	0.039	12	AGER, C3, CCL22, CEACAM6, IL1B, IL33, IL8, KITLG, LCN2, PRG2, RA
		adhesion of blood-derived mast cells	0.046	2	IL1B, IL33
Digestive System Development and Function	51	morphology of intestine	0.001	25	ABCC4, APC, C3, CD36, CFTR, FGFR2, FOLR1, HSD11B2, IL6ST, IRAK, MGLL, NFIX, PIGR, PLG, PPARGC1A, PTGS2, RORC, SLC12A2, SLC4A4, TFF1, TFF2, TGFB2, VDR
		morphology of digestive system	0.012	46	ABCC4, ANTXR1, APC, BHMT, C3, CD36, CFTR, CP, CSF1, FGFR2, FOL, FST, HSD11B2, IL6ST, IRAK3, ITGA3, LAMA3, LDLR, LRP6, MGLL, NCO, NFIX, NQO1, OSMR, PAX9, PIGR, PLG, PPARGC1A, PTGS2, RASGRF1, RUNX2, SIM2, SLC12A2, SLC4A4, SMAD3, SOD2, SPDEF, TFF1, TFF2, VDR, VEGFA
		secretion of saliva	0.023	5	AQP1, AQP5, C3, CHRM3, ITPR2
		morphology of colon	0.030	7	CFTR, MGLL, PLG, PTGS2, RORC, SLC12A2, VDR
		tooth development	0.041	11	ANTXR1, BMP2, CSF1, FGFR2, FST, LRP6, NFIC, PAX9, PLG, RUNX2, S
Hematopoiesis	23	colony formation of myeloid cells	0.003	10	CDA, CSF1, HOXA10, HOXA9, IL1B, IL6R, IL6ST, KITLG, MECOM, MLL
		colony formation of leukocytes	0.003	11	CDA, CSF1, HOXA10, HOXA9, IL1B, IL6R, IL6ST, KITLG, MECOM, MITF
		colony formation of colony forming multilineage cells	0.011	4	HOXA10, HOXA9, KITLG, MLL
		lymphopoiesis of bone marrow cells	0.011	4	CD44, FST, KITLG, LFNG
		colony formation of phagocytes	0.019	7	CDA, CSF1, HOXA10, HOXA9, KITLG, MITF, MLL
		colony formation of myeloid progenitor cells	0.028	5	CSF1, HOXA9, KITLG, MECOM, MLL
		hematopoiesis of bone marrow cells	0.028	6	CD44, FST, IL6R, IL6ST, KITLG, LFNG
		colony formation of hematopoietic progenitor cells	0.031	10	CDA, CSF1, HOXA10, HOXA9, IL6R, IL6ST, KITLG, MECOM, MLL, VEGF
		hematopoiesis of lymphatic system component	0.033	8	CD44, CSF1, EAF2, FST, IL6R, IL6ST, KITLG, LFNG

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		differentiation of bone marrow cells	0.037	16	BMP2, C3, CD44, CSF1, FGFR2, FST, IL33, IL6R, IL6ST, KITLG, LFNG, RUNX2, SMAD3, VDR, VEGFA
		lymphopoiesis of long-term bone marrow culture cells	0.046	2	CD44, FST
		colony formation of macrophages	0.048	5	CSF1, HOXA10, HOXA9, KITLG, MLL
Cardiovascular System Development and Function	39	proliferation of endothelial cells	0.003	28	AGER, ARHGAP24, BMP2, C3, CD36, CD44, COL4A1, COL4A3, CSF1, E, FGFR2, FZD5, HAS3, IL1B, IL8, KNG1, MGP, NRP2, PLG, PLXNA4, PTG, RICTOR, RUNX2, SLC8A1, TGFB2, VEGFA
		endothelial cell development	0.005	30	AGER, ARHGAP24, BMP2, C3, CD36, CD44, COL4A1, COL4A3, CSF1, C, EDNRB, FGFR2, FZD5, HAS3, IL1B, IL8, KNG1, MGP, NRP2, PLG, PLXN, PTPRM, RICTOR, RUNX2, SLC8A1, STC1, TGFB2, VEGFA
		development of cardiovascular tissue	0.015	31	AGER, ARHGAP24, BMP2, C3, CD36, CD44, COL4A1, COL4A3, CSF1, C, EDNRB, FGFR2, FZD5, HAS3, IL1B, IL8, KNG1, MGP, NRP2, PLG, PLXN, PTPRM, RICTOR, RUNX2, SLC8A1, STC1, TGFB2, TTN, VEGFA
		angiogenesis of lesion	0.016	4	HOXD3, KITLG, PLG, VEGFA
		activation of endothelial cells	0.028	9	C3, CSF1, HBEGF, IL1B, IL33, IL6R, RUNX2, TLR2, VEGFA
		activation of vascular endothelial cells	0.028	6	CSF1, HBEGF, IL1B, RUNX2, TLR2, VEGFA
		proliferation of microvascular endothelial cells	0.028	5	AGER, C3, IL1B, IL8, VEGFA
		binding of blood vessel	0.031	4	CD44, CXCL2, IL1B, IL8
		binding of endothelial cells	0.039	12	AGER, C3, CD44, HAS3, IL1B, IL8, ITGA3, KITLG, KNG1, PIGR, PLG, V
		binding of microvessel	0.041	3	CXCL2, IL1B, IL8
Hematological System Development and Function	23	colony formation of erythroid cell lines	0.003	6	HOXA10, HOXA9, IL6R, IL6ST, KITLG, MLL
		quantity of macrophages	0.028	17	ABCA1, BIRC3, CCL22, CNN2, CSF1, CXCL14, HBEGF, IL1B, IL33, LCN, PDGFC, PLG, PRF1, SFTP, VDR, VEGFA
		cell viability of blood-derived mast cells	0.041	3	IL1B, IL33, KITLG

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		development of epithelial tissue	0.003	40	ABCA3, AGER, ARHGAP24, BMP2, C3, CD36, CD44, COL4A1, COL4A3, CSF1, CXCL2, ECM1, EDNRB, EPB41L5, FGFR2, FZD5, GJB2, HAS3, HYIL8, KITLG, KNG1, LAMA3, MGP, MITF, NRP2, PLG, PLXNA4, PTGS2, PRICTOR, RUNX2, SLC8A1, SOX10, STC1, TGFB2, VEGFA, WT1
		inflammation of mucosa	0.019	3	ABCC1, PTGS2, SMAD3
		development of membrane tissue	0.028	5	BMP2, IL1B, LRP6, MECOM, SMAD3
		development of melanocytes	0.028	3	KITLG, MITF, SOX10
Tissue Development	72	development of connective tissue	0.033	23	AGER, BMP2, CSF1, ETV1, HBEGF, HOXA10, HOXD3, IL6R, IL6ST, INS, LAMA3, LPIN1, LRP6, MECOM, NOV, PTGS2, RUNX2, SMAD3, SOX5, T, VEGFA
		formation of epithelial tissue	0.033	11	ARHGAP24, CD44, COL4A1, COL4A3, COL4A4, IL8, KNG1, RUNX2, SL, WT1
		formation of connective tissue	0.041	6	BMP2, FST, PLG, SOX5, VEGFA, WT1
		adhesion of epithelial cells	0.046	11	C3, HBEGF, ITGA3, KLK6, LAMA3, MUC1, NOV, PIGR, SFTPD, SLPI, SC
		adhesion of mesothelial cells	0.046	2	HBEGF, ITGA3
Hair and Skin Development and Function	23	morphogenesis of hair follicle	0.004	8	FGFR2, FOXQ1, FST, KRT27, KRT71, PTGS2, TGFB2, TGM3
		development of epidermis	0.011	19	ALDH3A2, APC, CDSN, CST6, FGFR2, FLG, FOXQ1, FST, KLK5, KLK7, KRT71, LAMA3, PTGS2, STS, TGFB2, TGM3, VDR, VEGFA
		skin development	0.024	23	ALDH3A2, APC, ASPRV1, CDSN, CST6, DHCR24, FGFR2, FLG, FOXQ1, KLK7, KRT27, KRT71, LAMA3, PTGS2, SMAD3, SPINK5, STS, TGFB2, T, VEGFA
		development of hair	0.031	4	FGFR2, FST, SPINK5, VDR
		epithelialization of wound	0.046	2	SMAD3, VEGFA
Embryonic Development	7	invasion of embryonic cells	0.007	5	FST, IL8, MUC1, RUNX2, SCGB1A1
		invasion of trophoblast cells	0.028	4	FST, IL8, MUC1, SCGB1A1
		migration of melanoblasts	0.046	2	EDNRB, KITLG
Organismal Development	87	patterning of rostrocaudal axis	0.010	14	APC, EMX2, FOXA2, HOXA10, HOXA11, HOXA7, HOXA9, HOXB8, HOXD8, LRP6, MLL, PAX6

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		development of body axis	0.018	49	ALDH1A3, ANTXR1, APC, AQP1, AQP5, BMP2, COL4A3, CP, CSF1, CX3CR1, FGFR2, FOXA2, FST, FZD5, HESX1, HIP1, HOXA10, HOXA11, HOXA7, HOXB8, HOXD3, HOXD4, HOXD8, IL8, IRX3, IRX5, ITGA3, KNG1, LAM, LRP6, MAPT, MITF, MLL, NFIC, NFKBIZ, PAX6, PAX9, PLG, PLXNA4, RPLP0, SOD2, SP5, TGFB2, VEGFA, WT1
		growth of organism	0.033	37	ABCA1, ABCC1, ACACA, ALOX15B, AQP1, AQP5, BMP2, BPIFA1, CALB1, COL4A1, CSF1, DEFB1, FGFR2, FOXA2, GRB10, HBEGF, HHIP, HIP1, IL1B, ITPR2, PLG, SCNN1A, SFTP, SLC12A2, SLC34A2, SLC8A1, SMAD3, SS18, STC1, SYNJ1, TF, TMPRSS2, VDR, VEGFA
		morphogenesis of embryonic tissue	0.038	14	ALDH1A3, BMP2, CAT, CD44, EPB41L5, HOXA11, IRX3, IRX5, NTN4, SMAD3, TGFB2, WT1
		development of bone marrow cells	0.041	10	CD44, CSF1, FST, HOXA10, IL6R, IL6ST, KITLG, LFNG, NQO1, SMAD3, SMAD4, SMAD7, TSHZ3
Renal and Urological System Development and Function	35	morphology of kidney	0.018	22	ABCA1, CD36, COL4A3, EHD3, EMX2, FGFR2, HOXA11, HSD11B2, ITGB3, NFIA, PLG, PTGS2, SALL1, SCGB1A1, SCNN1B, SIX1, SLC12A1, SLC12A2, TNS1, WT1
		kidney development	0.028	23	AGER, ALDH1A3, APC, BMP2, CAT, CD44, COL4A3, COL4A4, CSF1, CX3CR1, FGFR2, HBEGF, HOXA11, LCN2, LRRK2, PTGS2, SALL1, SIX1, SLC12A1, VEGFA, WT1
		development of glomerular basement membrane	0.041	3	COL4A3, COL4A4, WT1
Organ Morphology	34	involution	0.019	8	CD44, CEBPD, CFTR, LCN2, PLG, PTGS2, SMAD3, VDR
		morphology of gland	0.038	28	ABCA1, AKAP12, ALDH1A3, ARNT2, AVPR1A, CFTR, EAF2, EMX2, FGFR2, HESX1, HOXA10, HOXD3, ITPR2, LDLR, NKX2-1, NKX3-1, PLG, RASGRB2, SMAD3, SPDEF, TFCP2L1, TGFB2, TLR2, VDR, VEGFA, WT1
		destruction of lung	0.046	2	CSF1, SFTP
Reproductive System	43	whole-cell conductance of oocytes	0.019	3	CFTR, SCNN1A, SCNN1B

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Development and Function		morphology of reproductive system	0.028	40	ABCA1, ACSL4, AKAP12, ANTXR1, AQP1, C3, CABLES1, CD44, CFTR, EAF2, EMX2, ETV5, FGFR2, GAL, GJB2, GRB10, HIP1, HOXA10, HOXA11, LIFR, LRP6, MNS1, NKX2-1, NKX3-1, NUPR1, PLG, PTGS2, RHCG, RIC1, SLC12A2, SLC34A2, SLC8A1, SS18, STC1, TGFB2, VDR, WT1
		morphology of genital organ	0.039	30	ABCA1, ACSL4, AKAP12, ANTXR1, AQP1, CABLES1, CD44, CFTR, EAF2, ETV5, GAL, HIP1, HOXA10, HOXA11, LFNG, LRP6, MNS1, NKX2-1, NKX3-1, NUPR1, PLG, PTGS2, RHCG, ROS1, SLC12A2, STC1, TGFB2, VDR, WT1
		involution of uterus	0.046	2	CD44, LCN2
Connective Tissue Development and Function	26	adipogenesis	0.019	13	ACACA, BMP2, C3, CEBPD, FGFR2, GRB10, LPIN1, NR4A2, PDK4, PLG, THRSP, VDR
		induction of connective tissue cells	0.041	3	BMP2, IL1B, RUNX2
		mineralization of fibroblast cell lines	0.041	3	BMP2, ESRRG, SMAD3
		differentiation of adipocytes	0.042	17	BMP2, CEBPD, ERO1L, FOXA2, IL1B, INSIG1, LPIN1, LRP6, MECOM, PDK4, RUNX2, SCD, SELENBP1, SMAD3, SOD2, VDR, WIF1
Skeletal and Muscular System Development and Function	56	mineralization of osteoblasts	0.019	6	BMP2, FST, HOXA10, MGP, PTGS2, RUNX2
		quantity of myofiber	0.023	5	FST, PPARGC1A, PRSS12, SIX1, VEGFA
		development of vertebral column	0.024	8	HIP1, HOXB8, HOXD8, LFNG, NFIX, PDGFC, SOX5, TGFB2
		fusion of bone	0.028	11	FGFR2, HOXA11, HOXA7, HOXA9, HOXD4, LFNG, MLL, NOV, PDGFC, SOX5
		colony formation of osteoclast precursor cells	0.031	4	HOXA10, HOXA9, KITLG, MLL
		quantity of vertebrae	0.034	6	FST, HOXA10, HOXA11, HOXA9, LFNG, PAX9
		differentiation of osteoclasts	0.040	16	APC, BMP2, C3, CSF1, IL33, IL6ST, IL8, IRAK3, MITF, PDK4, PTGS2, RASGRIP1, SMAD3, TF, TLR2, VEGFA
		synthesis of cartilage matrix	0.040	4	BMP2, IL1B, STC1, TLR2
		angiogenesis of bone	0.041	3	BMP2, TGFB2, VEGFA

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		morphology of skeletal system	0.049	37	ANTXR1, CALB1, CSF1, EMX2, EYA4, FGFR2, FOXA2, HOXA10, HOXA11, HOXB8, HOXD3, HOXD4, IL6ST, IRAK3, ITGA3, LFNG, LIFR, MGP, MLL, NKX2-1, NOV, PAX9, PDK4, RIMS1, RUNX2, SALL1, SIM2, SIX1, SLC45A3, SOX5, TGFB2, VDR, VEGFA
Nervous System Development and Function	24	development of diencephalon	0.026	6	ARNT2, LRP6, NCOR1, NRP2, PAX6, SIM2
		excitation of neurons	0.028	8	CCL22, GAL, HSD11B2, IL1B, KNG1, LCN2, PPP1R1B, SLC12A2
		development of pallium	0.041	3	EMX1, EMX2, PAX6
		quantity of synaptic vesicles	0.041	6	ABCA1, FGFR2, KIF1B, MAP6, RIMS1, UNC13B
		extension of parallel fiber	0.046	2	NFIA, NFIX
Tissue Morphology	112	abnormal morphology of membrane tissue	0.033	16	ABCC4, BIRC3, CD36, CFTR, CXADR, IL6ST, LDLR, MECOM, PTGS2, SLC8A1, SMAD3, SPDEF, TFF1, TFF2, VDR
		quantity of stem cells	0.038	7	CSF1, EDNRB, IL6ST, IL8, IRX3, KITLG, VEGFA
		permeability of epithelial tissue	0.040	4	AQP1, IL1B, IL8, VEGFA
		diameter of tumor tissue	0.046	2	APC, MMP7
		healing of wound	0.046	16	AQP1, CD44, CNN2, FST, HBEGF, HOXD3, IL6R, MMP7, PLG, PTGS2, SMAD3, TFF1, TGFB2, VEGFA
		quantity of cells	0.046	103	ABCA1, AGER, AQP1, AVPR1A, BIRC3, BMP2, C3, CALB1, CAT, CCL22, CD74, CFTR, CHI3L1, CNN2, COL4A3, CP, CSF1, CXCL14, CXCL2, DOT, EMX2, FGFR2, FST, GAL, GJB6, HBEGF, HESX1, HIP1, HIVEP3, HLA-DQ1, HLA-DQB1, HLA-DRB1, HOXA10, HOXA9, HSD11B2, IGFBP7, IL13, IL33, IL5RA, IL6R, IL6ST, IL8, IRAK3, IRX3, KIF1B, KITLG, KNG1, LAM, LDLR, LFNG, LIFR, MAPT, MECOM, MLL, MMP7, MUC1, NCOR1, NFIA, NKX3-1, NQO1, NR4A2, NRP2, PAX6, PDCD6, PDGFC, PDK4, PIGR, PIK3CA, PPARGC1A, PRF1, PRSS12, PTGS2, PTPN13, RASGRF1, RIMS1, RORC, SFTPD, SIX1, SLC12A2, SLC4A4, SLC8A1, SLC10A2, SMAD3, SOD2, STC1, TEC, TF, TFF2, TGFB2, TLR2, VDR, VEGFA, WT1
Lymphoid Tissue Structure and Development	20	lack of thymus gland	0.041	3	HOXD3, SIX1, VEGFA
		proliferation of lymphatic system cells	0.046	18	BMP2, CD44, CHI3L1, CSF1, CYSLTR1, EDNRB, FGFR2, HOXA10, HOXA11, KITLG, PRF1, SMAD3, TGFB2, TLR2, VDR, VEGFA

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Respiratory System Development and Function	16	function of respiratory system	0.041	7	AQP1, AQP4, AQP5, CFTR, CHRM3, HAS3, TLR2
		production of alveolar epithelial lamellar bodies	0.046	2	SFTPB, VEGFA
		proliferation of lung cell lines	0.049	7	CAT, EHF, NFIX, NKX2-1, PAX9, SOD2, TGFB2

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