

Supplementary Materials

Table S1. Pathological Characteristics of Pterygium

Corresponding Author, Year Published, Citation	Di Girolamo 2011 [26]	Reda 2018 [27]	Bergeron 2021 [28]
Number and Type of Specimens	n=59, primary n=41, recurrent	n=47	n=149
Location of Study	Sydney, Australia	Cairo, Egypt	Montreal, Canada
EPITHELIAL			
Atypia, dysplasia or neoplasia	12%	53.2%	20.8%
Squamous metaplasia, cell proliferation, migratory front	Common	83%	62%
Epithelial atrophy			26%
Melanocyte hyperplasia	Common	48.9%	31.5%
Goblet cell hyperplasia	Prominent	39.1%	5%
Fuch's flecks: basal epithelial cell clusters, basal cell hyperplasia	18%		28%
STROMAL			
Bowman's membrane dissolution	Common		
Solar elastosis	Common	100%	35%
Stromal plaques (associated with solar elastosis)	6%		46%
Neovascularization		76.6%	54%
Neovascularization with Hemorrhage			32%
Stromal angiogenesis, hemorrhage, fibrovascular proliferation, ECM deposition	Common		
INFLAMMATORY			
Acute inflammation (neutrophils)			3%
Chronic inflammation (lymphoplasmacytic infiltrate)	60%	70 -75%	22%
Histiocytes			26%

Table S2. Functions of all Upregulated Gene Products on Top 25 Lists

Gene (HUGO Designation)	Function of Gene Product
Cell Cycle Checkpoint and Genomic Stability	
<i>AATK</i>	Induced during apoptosis. Its expression may be a necessary pre-requisite for the induction of growth arrest.
<i>PLD6</i>	Endonuclease thought to be involved in maintaining genomic stability.
<i>SLC26A4-AS1</i>	Inhibits expression of DNA double-strand breaks repair genes [115]
Epithelial Differentiation Marker	
<i>KRT9</i>	Keratin 9; specific to the palmoplantar epidermis
<i>GJC2</i>	Connexin gap junction protein
Mucosal Differentiation Marker	
<i>MUC6</i>	Secreted mucin; marker for gastric mucosal epithelia
Epithelial Cornification	
<i>CAPN14</i>	Epithelial cornification; distinguishes mucosal epithelium of the lung from epidermis.
<i>FOSL1</i>	Fos family transcription factor, dimerizes with JUN family members, forming stress response transcription factor complex AP-1.
<i>SPRR3</i>	Epithelial cornification
<i>IVL</i>	Epithelial cornification protein
Epithelial Cell Fate and Differentiation	
<i>IGF1</i>	Insulin Like Growth Factor 1; epithelial proliferation upstream regulator
<i>NR2F1</i>	Nuclear hormone receptor and transcriptional regulator; cancer dormancy gene [116].
<i>PITX1</i>	Transcription factor that expressed in epithelial progenitor cells. Downregulation associated with malignant transformation of mucosal epithelia. However, expression is higher in precancerous dysplastic epithelia [117].
<i>POU5F1</i>	Transcription factor; Expressed in the basal layer of the corneal epithelium [60].
<i>PPM1N</i>	Putative Mg ²⁺ /Mn ²⁺ dependent Protein Phosphatase. The Gene Ontology Resource (GO) indicates that it is involved in negative regulation of I-kappaB kinase/NF-kappaB signaling and positive regulation of the canonical Wnt signaling pathway.
<i>SNAIL</i>	Regulation of epithelial-mesenchymal transition (EMT); also, involved in fibrovascular proliferation
Glycolysis and Gluconeogenesis	
<i>LDHAL6B</i>	Metabolic enzyme of the glycolysis/gluconeogenesis pathway
<i>PCK1</i>	Metabolic enzyme of the glycolysis/gluconeogenesis pathway
<i>TMPRSS11B</i>	promotes tumor growth by enhancing lactate export [31]
<i>ALDH1</i>	Alcohol dehydrogenase
<i>ADH1C</i>	Alcohol dehydrogenase
Protection against UV Light	
<i>LG3</i>	UVB irradiation stimulates secretion of LG3 protein, which protects against deleterious effects of UVB [35]
<i>NPIPA3</i>	Nuclear Pore Complex Interacting Protein; high expression in the retinal rod photoreceptors of the macula [36].
Expressed by Lymphocytes	
<i>CCR2</i>	Receptor for CCL2, a chemokine
<i>CD2</i>	Surface antigen found on all peripheral T-cells. Interacts with CD58 (LFA3) on antigen-presenting cells to optimize immune recognition.
<i>IDO1</i>	Indoleamine 2,3-dioxygenase; expressed in dendritic cells, monocytes, and macrophages, modulates T-cell behavior by its pericellular catabolization of the essential amino acid tryptophan
<i>NR2F1</i>	Orphan nuclear receptor and transcriptional regulator implicated in lymphocyte biology [118]
<i>SFRP2</i>	Wnt signaling modulator
Expressed by Lymphocytes: Immunoglobulin Chains	
<i>IGHA1</i>	Immunoglobulin Heavy Constant Alpha 1
<i>IGHA2</i>	Immunoglobulin Heavy Constant Alpha 2
<i>IGHG1</i>	Immunoglobulin Heavy Constant Gamma 1
<i>IGHM</i>	Immunoglobulin Heavy Constant Mu
<i>IGKC</i>	Immunoglobulin Heavy Kappa Constant
<i>IGLC2</i>	Immunoglobulin Lambda Constant 2
<i>IGLC3</i>	Immunoglobulin Lambda Constant 3
Immune Response	
<i>CLEC18A</i>	Lectin that functions as a co-receptor for TLR3 (toll-like receptor 3)
Fibrovascular Proliferation	
<i>HBA1</i>	Hemoglobin; red blood cell marker

<i>PI16</i>	Protease inhibitor produced by vascular endothelial cells.
<i>POSTN</i>	Periostin; ligand for alphaV/beta3 and alphaV/beta5 integrins; supports adhesion and migration of epithelial cells and vascular endothelial cells; [119].
<i>RP1-261G23.7</i>	Long noncoding RNA, antisense to VEGF, promotes VEGF gene expression [120].
Other	
<i>AC004943.1</i>	Transcription factor
<i>CGB7</i>	Beta subunit of chorionic gonadotropin. The alpha subunit is not transcribed in our samples.
<i>DSPP</i>	Dentin sialophosphoprotein
<i>FAM71A</i>	Rab2B interacting protein important in Golgi body integrity.
<i>MYCT1</i>	Overexpression mediates many of the known phenotypic features associated with transcription factor MYC.
<i>PEAK3</i>	(Probably) inactive protein kinase that acts as a scaffolding protein regulating cytoskeleton to control cell spreading and migration.
Unknown Function (11 genes)	
<i>AC007000.12</i> , <i>LSMEM1</i> , <i>PALM2-AKAP2</i> , <i>RP5-1126H10.2</i> , <i>RP5-1142A6.8</i> , <i>RP11-164P12.3</i> , <i>RP11-556K13.1</i> , <i>RP11-78A19.3</i> , <i>RP11-848G14.5</i> , <i>TMEM254-AS1</i> , <i>Z95704.2</i>	
Pseudogenes (7 genes)	
<i>CCDC163P</i> , <i>EIF4HP2</i> , <i>FABP5P3</i> , <i>FAM25HP</i> , <i>FOSL1P</i> , <i>RNU2-59P</i> , <i>ZBTB45P1</i>	

Table S3. Functions of all Downregulated Gene Products on Top 25 Lists

Gene (HUGO Designation)	Function of Gene Product
Tumor Suppressors	
<i>C10orf90</i>	Fragile Site Associated Tumor Suppressor; FATS; intracellular protein, promotes the activation of p53 in response to DNA damage, leading to a robust checkpoint response [37]. Chromosomal location at a common fragile site (CFS), susceptible to deletion in tumors induced by ionizing radiation.
<i>DMBT1</i>	Deleted in Malignant Brain Tumors 1; small secreted protein expressed at high levels by mucosal tissues [39,40].
<i>RARRES1</i>	Retinoic Acid Receptor Responder 1; a type I membrane protein. When <i>RARRES1</i> is depleted in epithelial cells, they rewire glucose metabolism by switching from aerobic glycolysis to glucose-dependent de novo lipogenesis [38].
<i>SCGB3A1</i>	Secretoglobulin Family 3A Member 1; small secreted protein expressed at high levels by mucosal tissues [41].
Immune Response	
<i>C3</i>	Complement Component 3
<i>CCL18</i>	Chemokine that attracts T-cells into tissues
<i>FCGR3A</i>	Receptor for Fc-gamma, expressed on the surface of leukocytes (NK and neutrophils), that mediates antibody-dependent cellular cytotoxicity and other antibody-dependent responses
<i>FAIM3</i>	Fc Receptor for IgM
<i>IGHG3</i>	Immunoglobulin
<i>MRC1</i>	Mannose receptor of the lectin family; alternative pathway for complement activation
Molecular Chaperones	
<i>HSPA1A</i>	HSP70 family
<i>HSPA1B</i>	HSP70 family
<i>HSPA6</i>	HSP70 family
<i>HSPA7</i>	HSP70 family
Detoxifying Enzymes	
<i>AKR1B10</i>	Aldo-keto reductase detoxification enzyme
<i>CYP1B1-AS1</i>	Cytochrome P450 family detoxifying enzyme antisense RNA
Epithelial Cell Type Markers	
<i>S100B</i>	Epithelial cell type marker
Mucosal Markers	
<i>MUC7</i>	Secreted mucin
Angiogenesis	
<i>HBA1</i>	Hemoglobin subunit; red blood cell marker
<i>HBA2</i>	Hemoglobin subunit; red blood cell marker
<i>HBB</i>	Hemoglobin subunit; red blood cell marker
Other	
<i>ATP6V1B1</i>	Component of vacuolar ATPase that mediates acidification
<i>POLR2J2</i>	RNA polymerase II subunit
<i>RNU1-2</i>	Small nuclear RNA
<i>RNU1-4</i>	Small nuclear RNA
<i>SNORA11D</i>	Small nucleolar RNA
<i>TAS2R46</i>	G-protein-coupled taste receptor
<i>WDR72</i>	Promotes amylogenesis
<i>ZSCAN23</i>	zinc finger transcription factor
Unknown Functions (16 genes)	
<i>AC084219.3, AC087392.1, CTD-3232M19.2, CTC-432M15.3, LINC00623, RP3-522J7.5, RP4-737E23.2, RP11-302B13.5, RP11-530C5.1, RP11-552F3.12, RP11-713P17.3, RP11-74C1.4, RP11-75A9.3, RP11-85F14.5, RPL36A-HNRNPH2, TSNA-X-DISC1</i>	
Pseudogenes (8 genes)	
<i>ATP1B1P1, EEF1B2P1, HERC2P5, KRT18P60, PFN1P3, RPSAP41, USP32P2, ZNF322P1</i>	

Table S4. Changes in Expression of Cell Type Signature Genes in Mouse

Gene (HUGO Designation)	Fold-change vs conjunctiva			Function
	Pterygium-E	Pterygium-NE	Pinguecula	
EPITHELIAL CELL TYPES				
Superficial Differentiated				
GJB4	1.68	1.21	-2.31	Connexin gap junction protein
Corneal				
PBK	-4.09	-5.07	-1.61	
MUC4	2.48	1.09	1.35	Corneal mucin
H2AX	Not expressed			Histone that is acetylated in DNA damage
Conjunctival				
KRT4	2.39	4.37	-1.20	
KRT13	1.57	3.34	-1.68	
MUC1	1.27	1.18	-1.06	
MUC20	1.50	1.27	-1.60	
Mature Transit Amplifying Cells				
MKI67	-1.70	-3.78	1.29	
Corneal Limbal Basal				
TXNIP	-1.98	-1.71	1.12	
Corneal Limbal Progenitor				
LRIG2	-1.39	-1.23	-1.27	
KRT19	1.28	1.37	1.03	Corneal limbal stem cells
STROMAL CELL TYPES				
Stromal Cells				
KERA	Not expressed			
LUM	-2.41	-1.58	2.89	
VIM	-1.64	-1.65	2.29	
Corneal Stromal Stem Cell				
KERA	Not expressed			
SCF	Not expressed			
FH1	Not expressed			
CD90	Not expressed			
SIX2	-1.14	-1.67	1.31	
Color Key				
DEGs 5-fold higher than conjunctiva			DEGs 5-fold lower than conjunctiva	
DEGs 4 to 5-fold higher than conjunctiva			DEGs 4 to 5-fold lower than conjunctiva	
DEGs 3 to 4-fold higher than conjunctiva			DEGs 3 to 4-fold lower than conjunctiva	
DEGs 2 to 3-fold higher than conjunctiva			DEGs 2 to 3-fold lower than conjunctiva	
DEGs 1.5 to 2-fold higher than conjunctiva			DEGs 1.5 to 2-fold lower than conjunctiva	

Table S5. Epithelial Cell Proliferation

Gene (HUGO Designation)	Fold-change vs conjunctiva			Protein Function
	Pterygium-E	Pterygium-NE	Pinguecula	
LIGANDS				
IGF1	-1.18	-2.07	16.78	Insulin-Like Growth Factor 1
TGFA	1.41	1.24	-1.33	Transforming Growth Factor Alpha
EGF	1.20	1.25	-1.70	Epidermal Growth Factor
HGF	1.05	-1.47	6.77	Hepatocyte Growth Factor
HBEGF	4.55	3.49	1.34	Heparin Bound Epidermal Growth Factor
AREG	1.77	5.03	1.40	Amphiregulin
AREGB	1.98	4.53	1.35	Amphiregulin B
EREG	1.87	1.75	1.23	Epiregulin
NRG1	1.14	1.62	-1.33	Neuregulin 1
NRG2	1.35	1.37	1.22	Neuregulin 2
NRG4	1.98	1.94	1.03	Neuregulin 4
CELL SURFACE RECEPTORS				
IGF1R	-1.05	-1.12	-1.01	IGF1 Receptor
EGFR	-1.08	1.21	-1.24	EGF Receptor
EGFR-AS	1.38	1.20	-1.36	EGF Receptor Antisense RNA
ERBB2	1.41	1.16	-1.03	
ERBB3	1.25	-1.03	1.04	
ERBB4	1.10	-1.01	1.28	
MET	-1.02	1.13	-1.33	
CO-RECEPTORS				
ITGAV	-1.48	-1.53	1.01	Integrin Alpha V
ITGB3	-1.87	-1.79	1.43	Integrin Beta 3
ITGA6	1.12	1.45	-1.09	Integrin Alpha 6
ITGB4	1.06	1.00	-1.39	Integrin Beta 4
SMALL GTPASES				
HRAS	1.27	1.43	-1.29	
KRAS	1.13	1.29	1.20	
NRAS	1.15	1.38	-1.13	
RASA1	-1.24	-1.28	1.28	
RASA2	1.20	1.02	1.06	
PROTEIN KINASES				
AKT1	1.02	1.01	-1.00	
AKT2	1.24	-1.20	-1.14	
AKT3	-1.93	-1.74	1.83	Protein Kinase B
MAPK1 (ERK)	1.04	-1.03	1.03	
MAP2K1P1 (MEK)	-2.04	-1.86	-1.08	
PIK3CA	-1.09	-1.33	1.21	
DISEASE-ASSOCIATED GENE				
PSORS1C1	4.64	2.22	1.65	Psoriasis Susceptibility 1 Candidate 1; unknown function
Color Key				
DEGs 5-fold higher than conjunctiva			DEGs 5-fold lower than conjunctiva	
DEGs 4 to 5-fold higher than conjunctiva			DEGs 4 to 5-fold lower than conjunctiva	
DEGs 3 to 4-fold higher than conjunctiva			DEGs 3 to 4-fold lower than conjunctiva	
DEGs 2 to 3-fold higher than conjunctiva			DEGs 2 to 3-fold lower than conjunctiva	
DEGs 1.5 to 2-fold higher than conjunctiva			DEGs 1.5 to 2-fold lower than conjunctiva	

Table S6. Epithelial Cell Fate

Gene (HUGO Designation)	Fold-change vs conjunctiva			Protein Function
	Pterygium-E	Pterygium-NE	Pinguecula	
TRANSCRIPTION FACTORS				
<i>EHF</i>	1.23	1.02	1.20	
<i>KLF4</i>	1.81	1.22	1.35	
<i>KLF5</i>	1.41	1.11	-1.12	
<i>KLF7</i>	-1.22	-1.12	1.37	
<i>KLF10</i>	2.15	2.49	1.33	Works through TGFB signaling
<i>MYC</i>	2.34	3.25	-1.37	
<i>PAX6</i>	1.41	-1.38	-1.02	Master regulator of eye development
<i>PITX1</i>	9.86	8.20	1.36	
<i>POU5F1</i>	9.36	9.09	1.84	
<i>SNAIL</i>	2.18	11.98	6.09	
<i>TP63</i>	1.22	1.40	-1.28	
SECRETED LIGANDS				
<i>BMP1</i>	1.40	1.18	-1.22	Bone Morphogenetic Protein 1
<i>BMP2</i>	1.65	2.22	-1.01	Bone Morphogenetic Protein 2
<i>BMP3</i>	1.33	-1.03	1.53	Bone Morphogenetic Protein 3
<i>BMP4</i>	1.43	1.24	1.38	Bone Morphogenetic Protein 4
<i>BMP6</i>	1.23	1.58	2.61	Bone Morphogenetic Protein 6
<i>BMP7</i>	1.49	1.43	-1.28	Bone Morphogenetic Protein 7
<i>TGFB1</i>	1.34	1.06	1.12	Transforming Growth Factor Beta 1
<i>TGFB2</i>	-1.20	-1.66	3.61	Transforming Growth Factor Beta 2
<i>TGFB3</i>	-1.43	-1.66	2.31	Transforming Growth Factor Beta 3
Color Key				
DEGs 5-fold higher than conjunctiva			DEGs 5-fold lower than conjunctiva	
DEGs 4 to 5-fold higher than conjunctiva			DEGs 4 to 5-fold lower than conjunctiva	
DEGs 3 to 4-fold higher than conjunctiva			DEGs 3 to 4-fold lower than conjunctiva	
DEGs 2 to 3-fold higher than conjunctiva			DEGs 2 to 3-fold lower than conjunctiva	
DEGs 1.5 to 2-fold higher than conjunctiva			DEGs 1.5 to 2-fold lower than conjunctiva	

Table S7. Notch and Wnt Signaling

Gene	Fold-change vs conjunctiva		
	Pterygium-E	Pterygium-NE	Pinguecula
NOTCH SIGNALING			
LIGANDS			
<i>DLL1</i>	-1.02	1.01	1.08
<i>DLL4</i>	-1.76	1.08	1.30
<i>JAG1</i>	1.38	1.57	1.17
<i>JAG2</i>	-1.22	-1.10	-1.13
RECEPTORS			
<i>NOTCH1</i>	1.39	1.22	-1.30
<i>NOTCH2</i>	1.25	1.16	1.15
<i>NOTCH3</i>	1.60	1.20	-1.14
<i>NOTCH4</i>	-3.22	-1.54	1.37
ENDOCYTIC ADAPTORS			
<i>NUMB</i>	1.09	-1.20	1.16
<i>NUMBL</i>	3.00	2.67	1.02
TRANSCRIPTION FACTORS			
<i>HES1</i>	1.04	-1.32	-1.13
<i>HES2</i>	1.26	1.40	-1.72
<i>HES4</i>	1.46	1.45	-1.40
<i>HES5</i>	6.02	3.21	-1.69
<i>HES6</i>	-2.47	-1.46	-1.74
TRANSCRIPTIONAL COACTIVATORS			
<i>MAML1</i>	1.03	-1.06	-1.12
<i>MAML2</i>	-1.05	-1.03	-1.11
<i>MAML3</i>	1.32	1.03	1.03
<i>MAMLD1</i>	-1.49	-1.74	1.11
WNT SIGNALING			
CATENINS			
<i>CTNNB1</i>	-1.17	-1.15	1.21
TUMOR SUPPRESSORS			
<i>APC</i>	1.02	-1.11	1.27
<i>AXIN1</i>	1.51	1.34	-1.20
<i>AXIN2</i>	1.05	1.30	2.37
PROTEIN KINASES			
<i>CSNK1A1</i>	1.20	1.34	-1.03
<i>GSK3A</i>	1.50	1.34	1.12
PROTEIN PHOSPHATASES			
<i>PPM1N</i>	5.87	17.06	9.54
LIGANDS			
<i>WNT2B</i>	1.63	1.28	1.62
<i>WNT3</i>	-1.36	-1.54	1.08
<i>WNT4</i>	1.24	-1.02	-1.11
<i>WNT3A</i>	1.44	-1.07	1.05
<i>WNT5A</i>	1.04	-1.11	1.37
<i>WNT5B</i>	1.02	-1.58	2.00
<i>WNT7A</i>	1.09	1.05	-1.35
<i>WNT7B</i>	2.29	2.14	-1.19
<i>WNT9A</i>	3.76	3.50	-1.11
<i>WNT10A</i>	-1.71	-1.20	-1.41
INHIBITORS			
<i>DKK2</i>	-1.60	-1.68	3.48
<i>DKK3</i>	-1.46	-1.76	-1.10
<i>DKK4</i>	-1.74	-1.20	-1.22
<i>SFRP1</i>	1.33	2.46	1.55
<i>SFRP2</i>	2.38	1.43	14.57
<i>FRZB</i>	-2.13	-1.63	2.08
<i>SFRP4</i>	1.41	-2.79	6.09
RECEPTORS			
<i>FZD1</i>	-1.12	-1.15	1.47
<i>FZD3</i>	-1.22	-1.29	1.35
<i>FZD4</i>	-1.78	-1.38	3.75
<i>FZD5</i>	-1.01	-1.12	1.04
<i>FZD6</i>	-1.48	-1.63	-1.07
<i>FZD7</i>	1.00	1.21	1.32
<i>FZD8</i>	2.00	1.43	-1.35
<i>FZD10</i>	1.43	2.23	1.06
<i>FZD10-AS1</i>	1.11	3.98	1.74
RECEPTOR INTERACTING PROTEINS			
<i>DVL1</i>	2.07	1.47	-1.07
<i>DVL2</i>	1.10	1.08	-1.36
<i>DVL3</i>	1.34	1.04	1.06

OTHER ACTIVATING PROTEINS			
<i>LGR4</i>	1.00	-1.08	1.06
<i>LGR5</i>	2.63	-1.55	12.58
TRANSCRIPTION FACTORS			
<i>TCF4</i>	-1.67	-1.37	2.11
<i>TCF7</i>	2.12	2.39	2.08
Color Key			
DEGs 5-fold higher than conjunctiva			
DEGs 4 to 5-fold higher than conjunctiva			
DEGs 3 to 4-fold higher than conjunctiva			
DEGs 2 to 3-fold higher than conjunctiva			
DEGs 1.5 to 2-fold higher than conjunctiva			
DEGs 5-fold lower than conjunctiva			
DEGs 4 to 5-fold lower than conjunctiva			
DEGs 3 to 4-fold lower than conjunctiva			
DEGs 2 to 3-fold lower than conjunctiva			
DEGs 1.5 to 2-fold lower than conjunctiva			

Table S8. Keratin Genes Expressed

Gene (HUGO Designation)		Fold-change vs conjunctiva			Known expressing epithelial cell type					
Type I acidic KRT9-19	Type II basic KRT1-8	Pterygium-E	Pterygium-NE	Pinguecula	Cornea	Conj.	Limbal	Goblet	MBG	Skin
Keratins of corneal-type epithelia (basal and suprabasal)										
	KRT3	2.88	2.13	-1.53	X		X			
	KRT12	1.28	-1.67	-1.84	X		X			
Keratins of mucosal and other stratifying soft epithelia (suprabasal)										
	KRT4	2.39	4.37	-1.20	X	X				
	KRT10	1.56	1.62	-1.24	X	X	X		X	X
	KRT13	1.57	3.34	-1.68	X	X				
	KRT78	2.63	5.87	-1.46				Tongue		
	KRT80	1.85	3.99	1.14				Tongue		
Keratins of stratifying epithelia (basal)										
	KRT5	1.64	1.89	-1.64	X	X	X			X
	KRT14	1.17	1.06	-2.04	X	X	X			X
	KRT15	-1.32	1.07	-1.95	X	X	X			X
Keratins of hyperproliferative epithelia (basal)										
	KRT6A	1.64	1.43	-1.48	X	X	X			X
	KRT6B	3.54	1.00	-1.36	X	X	X			X
	KRT6C	3.68	2.12	-1.09	X	X	X			X
	KRT16	4.48	2.65	-1.41	X	X				X
	KRT17	3.40	6.38	-1.68	X	X	X			X
Keratins of hyperproliferative epithelia (suprabasal)										
	KRT9	8.25	4.74	11.86	Palmoplantar epidermis					
Keratins of simple epithelia										
	KRT7	1.37	1.35	-1.17		X		X		
	KRT8	1.27	-1.03	-1.83	X	X	X			X
	KRT18	1.49	1.10	-1.69	X	X	X			X
	KRT19	1.28	1.37	1.03	X	X	X			X
	KRT23	1.40	1.51	1.25	Not previously identified in ocular surface epithelia					
	KRT24	-3.34	2.63	-1.45			X			
Keratins of hard epithelia										
	KRT31	-2.51	-1.46	-1.92	Hair cortex, nail matrix					
	KRT40	1.30	1.53	1.31	Upper hair cuticle					
Unknown										
	KRT222	-1.60	-1.33	1.65						
Color Key										
DEGs 5-fold higher than conjunctiva				DEGs 5-fold lower than conjunctiva						
DEGs 4 to 5-fold higher than conjunctiva				DEGs 4 to 5-fold lower than conjunctiva						
DEGs 3 to 4-fold higher than conjunctiva				DEGs 3 to 4-fold lower than conjunctiva						
DEGs 2 to 3-fold higher than conjunctiva				DEGs 2 to 3-fold lower than conjunctiva						
DEGs 1.5 to 2-fold higher than conjunctiva				DEGs 1.5 to 2-fold lower than conjunctiva						

Abbreviations:
 Conj.: conjunctiva; Goblet: conjunctival goblet cell; MBG: Meibomian gland

Subcategory Definitions:

- Corneal-type epithelial keratins (suprabasal): expression specific to the corneal epithelium and limbal progenitors.
- Mucosal and other soft epithelial keratins (suprabasal): keratins expressed suprabasally in the conjunctival epithelium belong to this group. Keratin 10 is a Meibomian gland marker in mice [17].
- Stratifying epithelial keratins (basal): Expressed in basal cells and progenitor cells of stratifying epithelial tissues.
- Hyperproliferative epithelial keratins (basal): expressed in stratified squamous epithelia including the ocular surface epithelia, the epidermis, the tongue, the hair follicles and the palmoplantar epidermis; upregulated in healing skin wounds and hyperproliferative epidermal disorders [18].
- Simple epithelial keratins: expressed in simple (single-layered) epithelia. Keratin 7 is a goblet cell marker [20].
- Hard epithelial keratins: Expressed in hair and nails.

Table S9. Transient Receptor Potential (TRP) Channels Expressed

Gene (HUGO Designation)	Fold-change vs conjunctiva			Function
	Pterygium-E	Pterygium-NE	Pinguecula	
TRPC1	-1.60	-1.62	1.56	Transient receptor potential cation channel subfamily C member 1
TRPC6	-2.48	-1.63	1.83	Transient receptor potential cation channel subfamily C member 6
TRPM1	-2.94	-1.65	1.01	Transient receptor potential cation channel subfamily M member 1
TRPM2	-2.05	-1.89	-1.13	Transient receptor potential cation channel subfamily M member 2
TRPM3	1.69	-1.33	1.41	Transient receptor potential cation channel subfamily M member 3
TRPM4	1.57	1.72	1.09	Transient receptor potential cation channel subfamily M member 4
TRPM6	-1.78	-1.90	-1.34	Transient receptor potential cation channel subfamily M member 6
TRPM7	-1.35	-1.30	1.14	Transient receptor potential cation channel subfamily M member 7
TRPV1	1.56	-1.03	1.07	Transient receptor potential cation channel subfamily V member 1
TRPV2	-1.19	-1.15	5.07	Transient receptor potential cation channel subfamily V member 2
TRPV3	5.57	6.23	1.53	Transient receptor potential cation channel subfamily V member 3
TRPV4	1.39	-1.07	1.41	Transient receptor potential cation channel subfamily V member 4
TRPV6	-1.23	-1.53	1.02	Transient receptor potential cation channel subfamily V member 5
Color Key				
DEGs 5-fold higher than conjunctiva			DEGs 5-fold lower than conjunctiva	
DEGs 4 to 5-fold higher than conjunctiva			DEGs 4 to 5-fold lower than conjunctiva	
DEGs 3 to 4-fold higher than conjunctiva			DEGs 3 to 4-fold lower than conjunctiva	
DEGs 2 to 3-fold higher than conjunctiva			DEGs 2 to 3-fold lower than conjunctiva	
DEGs 1.5 to 2-fold higher than conjunctiva			DEGs 1.5 to 2-fold lower than conjunctiva	

Table S10. Keratinization and Cornification

Gene (HUGO Designation)	Fold-change vs conjunctiva			Protein Function
	Pterygium-E	Pterygium-NE	Pinguecula	
Regulatory Transcription Factor				
SNAI1	2.18	11.98	6.09	transcriptional repressor; epithelial-mesenchymal transition
FOSL1	2.97	14.79	-1.26	
PAX6	1.41	-1.38	-1.02	
Conjunctival Differentiation Markers				
KRT4	2.39	4.37	-1.20	Conjunctival keratin
KRT14	1.57	3.34	-1.68	Conjunctival keratin
Keratin Aggregation				
KRT10	1.56	1.62	-1.24	Epidermal keratin
FLG2	-1.09	1.26	1.65	Filaggrin 2
FLG	-1.19	-1.38	1.20	Filaggrin
KRT1	Not expressed			Epidermal keratin
Desmosome Assembly				
PPL	2.03	2.58	-1.30	Periplakin
PKP1	2.41	2.35	-1.37	Plakophilin 1
DSP	1.57	1.97	-1.25	Desmoplakin
EVPL	2.27	1.93	-1.34	Envoplakin
DSG3	1.15	1.92	-1.34	Desmoglein 3
PERP	-1.09	1.06	-1.50	P53 Apoptosis Effector Related to PMP22
Cornified Envelope Assembly				
SPRR3	2.75	34.38	1.48	Small Proline Rich Protein 3
IVL	3.83	28.63	-1.27	Involucrin
CAPN14	4.27	10.73	-2.37	Calpain 14
SPRR1B	2.57	3.39	-1.65	Small Proline Rich Protein 1B
TGM4	4.30	2.65	1.04	Transglutaminase 4
SPRR2A	1.65	2.50	-1.66	Small Proline Rich Protein 2A
ABCA12	1.10	2.20	-1.63	Transporter involved in lipid homeostasis
CSTA	-1.30	2.05	-1.27	Cystatin A; precursor to cornified envelope
SCEL	1.27	2.14	-1.12	
TCHH	-1.29	1.07	-1.11	Trichohyalin
Desquamation				
KLK7	3.16	8.84	5.08	Kallikrein Related Peptidase 7
IL1RN	1.91	4.49	-1.76	Interleukin 1 receptor antagonist
SPINK5	-1.10	2.47	-1.69	Serine Peptidase Inhibitor Kazal Type 5
KAZN	1.69	1.64	-1.19	Kazrin; inhibits KLK5
Color Key				
DEGs 5-fold higher than conjunctiva			DEGs 5-fold lower than conjunctiva	
DEGs 4 to 5-fold higher than conjunctiva			DEGs 4 to 5-fold lower than conjunctiva	
DEGs 3 to 4-fold higher than conjunctiva			DEGs 3 to 4-fold lower than conjunctiva	
DEGs 2 to 3-fold higher than conjunctiva			DEGs 2 to 3-fold lower than conjunctiva	
DEGs 1.5 to 2-fold higher than conjunctiva			DEGs 1.5 to 2-fold lower than conjunctiva	

Table S11. Mucin Genes Expressed

Gene (HUGO Designation)	Fold-change vs conjunctiva			Function
	Pterygium-E	Pterygium-NE	Pinguecula	
Secreted mucins				
MUC2	-2.28	-7.22	-1.54	Gel-forming
MUC5AC	-1.76	-1.78	3.31	Gel-forming
MUC5B	-1.82	1.10	1.42	Gel-forming
MUC6	8.45	10.96	2.62	Gel-forming
MUC7	-51.82	-8.48	-2.36	Soluble monomer
OVGP1	1.49	1.52	-1.43	Soluble monomer (previously known as MUC9)
MUC19	Not expressed			
Membrane-associated mucins				
MUC1	1.27	1.18	-1.06	
MUC3A	-2.67	-2.11	-2.30	
MUC4	2.48	1.09	1.35	
MUC12	-1.42	-1.30	-1.29	
MUC13	Not expressed			
MUC15	1.17	1.22	-1.03	
MUC16	2.28	1.22	1.01	
MUC17	Not expressed			
MUC20	1.50	1.27	-1.60	
MUC21	1.60	1.95	-2.09	
MUC22	1.08	1.60	-2.28	
Color Key				
DEGs 5-fold higher than conjunctiva			DEGs 5-fold lower than conjunctiva	
DEGs 4 to-5-fold higher than conjunctiva			DEGs 4 to-5-fold lower than conjunctiva	
DEGs 3 to 4-fold higher than conjunctiva			DEGs 3- to 4fold lower than conjunctiva	
DEGs 2 to 3-fold higher than conjunctiva			DEGs 2 to 3-fold lower than conjunctiva	
DEGs 1.5 to 2-fold higher than conjunctiva			DEGs 1.5 to 2-fold lower than conjunctiva	

Table S12. Angiogenesis

Gene (HUGO Designation)	Fold-change vs conjunctiva			
	Pterygium-E	Pterygium-NE	Pinguecula	
Markers of blood vessels				
HBA1	-13.53	-14.70	13.58	Hemoglobin Subunit Alpha 1
HBA2	-10.64	-10.17	3.76	Hemoglobin Subunit Alpha 2
HBB	-11.00	-11.87	5.39	Hemoglobin Subunit Beta
PI16	1.38	-1.09	26.83	Protease inhibitor that regulates vascular permeability
Angiogenesis regulators				
TYMP	-1.27	-2.61	-1.19	Promotes angiogenesis
VEGFA	4.26	2.15	-1.04	Promotes angiogenesis
RP1-261G23.7	13.43	9.05	1.22	VEGFA antisense; enhances VEGFA gene expression
RP11-203J24.8	9.66	9.95	-1.36	BAIAP2 antisense (barcode angiogenesis inhibitor-binding protein)
Color Key				
DEGs 5-fold higher than conjunctiva			DEGs 5-fold lower than conjunctiva	
DEGs 4 to 5-fold higher than conjunctiva			DEGs 4 to 5-fold lower than conjunctiva	
DEGs 3 to 4-fold higher than conjunctiva			DEGs 3-fold lower than conjunctiva	
DEGs 2 to 3-fold higher than conjunctiva			DEGs 2 to 3-fold lower than conjunctiva	
DEGs 1.5 to 2-fold higher than conjunctiva			DEGs 1.5 to 2-fold lower than conjunctiva	

Table S13. Extracellular Matrix and Cell Surface Receptors

Gene (HUGO Designation)	Fold-change vs conjunctiva			Function
	Pterygium-E	Pterygium-NE	Pinguecula	
Integrins				
ITGA1	-1.41	-1.19	6.42	Integrin Alpha 1; dimerizes with ITGB1; collagen/laminin receptor
ITGA2	1.06	1.06	-1.37	
ITGA3	1.56	1.13	-1.74	Integrin Alpha 3
ITGA4	-2.10	-3.80	4.31	Integrin Alpha 4; dimerizes with ITGB1 or ITGB7; fibronectin receptor
ITGA6	1.12	1.45	-1.09	
ITGAE	-1.90	-2.19	1.27	Integrin Alpha E
ITGAL	-2.00	-3.04	4.93	Integrin Alpha L; lymphocytes; dimerizes with ITGB3; binds ICAMs
ITGAM	-1.92	-3.13	-1.03	
ITGAV	-1.48	-1.53	1.01	Integrin Alpha V
ITGB1	-1.09	-1.01	-1.11	Integrin Beta 1
ITGB3	-1.87	-1.79	1.43	Integrin Beta 3
ITGB4	1.06	1.00	-1.39	Integrin Beta 4
ITGB5	1.11	-1.01	-1.21	Integrin Beta 5
ITGB7	1.55	1.25	1.59	Integrin Beta 7
ITGB8	1.20	1.59	-1.13	Integrin Beta 8
Basement Membrane Zone Extracellular Matrix				
COL4A1	-1.82	-1.71	2.52	Collagen Type IV Alpha 1 Chain
COL4A2	-1.60	-1.24	2.01	
COL4A3	-1.61	-1.39	1.25	Collagen Type IV Alpha 3 Chain
COL4A4	-1.38	-1.29	1.00	Collagen Type IV Alpha 4 Chain
COL4A5	-1.13	-1.50	-1.17	Collagen Type IV Alpha 5 Chain
COL4A6	-1.37	-2.05	-1.96	Collagen Type IV Alpha 6 Chain
LAMA1	-1.84	-1.00	-4.22	Laminin Alpha 1
LAMA2	-1.76	-1.00	1.23	Laminin Alpha 2
LAMA3	-1.11	1.20	-1.28	Laminin Alpha 3
LAMA4	-1.41	-1.43	3.10	Laminin Alpha 4
LAMA5	1.61	1.11	-1.15	Laminin Alpha 5
FBLN1	1.11	1.05	2.82	Fibulin 1
FBLN2	1.14	-1.11	-1.08	Fibulin 2
FBLN5	-1.20	-1.17	3.46	Fibulin 5
FBLN7	-1.81	1.14	-1.33	Fibulin 7
FN1	-4.02	-4.85	3.17	Fibronectin 1
POSTN	-7.13	-4.82	12.06	Periostin
Basement Membrane Zone Extracellular Matrix				
ADAMTS14	5.41	3.15	-1.51	Type I procollagen N-propeptidase
DCN	-1.25	-1.27	1.99	
COL1A1	-2.25	-4.04	2.63	Collagen Type I Alpha Chain 1
COL1A2	-1.47	-2.17	2.64	Collagen Type I Alpha Chain 2
COL3A1	-1.67	-2.40	3.01	Collagen Type 3 Alpha Chain 1
COL5A1	-1.85	-2.39	1.83	Collagen Type 5 Alpha Chain 1
COL5A2	-2.68	-2.34	1.29	Collagen Type 5 Alpha Chain 2
COL5A3	1.12	1.28	-1.35	Collagen Type 5 Alpha Chain 3
COL6A1	-1.51	-1.62	1.59	Collagen Type 6 Alpha Chain 1
COL6A2	-1.03	-1.12	1.58	Collagen Type 6 Alpha Chain 2
COL6A3	-1.86	-2.58	1.87	Collagen Type 6 Alpha Chain 3
COL6A6	1.01	-3.11	-1.20	Collagen Type 6 Alpha Chain 6
COL7A1	-1.46	-1.80	-1.54	Collagen Type 7 Alpha Chain 1
COL8A1	-1.60	-1.19	4.24	Collagen Type 8 Alpha Chain 1
COL8A2	-1.70	-2.04	2.11	Collagen Type 8 Alpha Chain 2
COL9A2	-1.27	-1.21	-1.52	Collagen Type 9 Alpha Chain 2
COL10A1	-3.35	-1.94	-1.25	Collagen Type 10 Alpha Chain 1
COL11A2	-2.00	-1.39	1.55	Collagen Type 11 Alpha Chain 2
COL12A1	-2.37	-1.97	-1.07	Collagen Type 12 Alpha Chain 1
COL14A1	1.32	-1.60	4.47	Collagen Type 14 Alpha Chain 1
COL15A1	-1.36	-1.21	2.84	Collagen Type 15 Alpha Chain 1
COL16A1	-1.65	-1.39	-1.62	Collagen Type 16 Alpha Chain 1
COL17A1	-1.12	-1.45	-1.50	Collagen Type 17 Alpha Chain 1
COL18A1	-1.44	-1.51	-1.17	Collagen Type 18 Alpha Chain 1
COL21A1	1.57	-1.28	1.91	Collagen Type 21 Alpha Chain 1
COL23A1	1.13	1.14	1.39	Collagen Type 23 Alpha Chain 1
COL25A1	-1.23	1.20	2.02	Collagen Type 25 Alpha Chain 1
COL27A1	-2.39	-3.04	1.19	Collagen Type 27 Alpha Chain 1
COL28A1	-1.03	-1.74	1.22	Collagen Type 28 Alpha Chain 1
SPARC	-2.09	-1.75	1.84	SPARC
Color Key				
DEGs 5-fold higher than conjunctiva			DEGs 5-fold lower than conjunctiva	
DEGs 4 to 5-fold higher than conjunctiva			DEGs 4 to 5-fold lower than conjunctiva	
DEGs 3 to 4-fold higher than conjunctiva			DEGs 3 to 4-fold lower than conjunctiva	
DEGs 2 to 3-fold higher than conjunctiva			DEGs 2 to 3-fold lower than conjunctiva	
DEGs 1.5 to 2-fold higher than conjunctiva			DEGs 1.5 to 2-fold lower than conjunctiva	

Table S14. MMPs and TIMPs

Gene (HUGO Designation)	Fold-change vs conjunctiva			MMP genes upregulated in repairing mouse ocular surface epithelium [21]	
	Pterygium-E	Pterygium-NE	Pinguecula	Unwounded	Repairing
MMP1	Not expressed				
MMP1a	Mouse only				X
MMP1b	Mouse only				X
MMP2	-1.49	-2.47	2.07	X	
MMP3	-1.21	1.97	-1.83	X	
MMP7	-8.19	-9.18	-1.70	X	
MMP8	Not detected				
MMP9	Not detected				X
MMP10	1.19	-3.90	2.95		X
MMP11	Not detected				
MMP12	-1.33	-1.30	1.49		X
MMP13	Not detected				X
MMP14	1.19	-1.01	-1.05	X	
MMP15	1.30	-1.17	-1.78		
MMP16	-1.24	-1.52	3.30		
MMP17	-3.58	-1.76	1.25		
MMP19	-1.86	-1.43	-1.09		
MMP20	Not detected				
MMP21	Not detected				
MMP24	-1.28	-1.35	-1.99		
MMP24-AS1	1.21	-1.06	1.04		
MMP25	-5.08	-3.33	1.16		
MMP26	Not detected				
MMP28					
TIMP1	-1.18	-1.47	1.45		
TIMP2	-1.23	-1.42	1.77		
TIMP3	-1.43	-1.08	1.59		
TIMP4	Not detected				
Color Key					
DEGs ≥ 5-fold higher than conjunctiva			DEGs ≥ 5-fold lower than conjunctiva		
DEGs ≥ 4 to 5-fold higher than conjunctiva			DEGs ≥ 4 to 5-fold lower than conjunctiva		
DEGs ≥ 3 to 4-fold higher than conjunctiva			DEGs ≥ 3-fold lower than conjunctiva		
DEGs ≥ 2 to 3-fold higher than conjunctiva			DEGs ≥ 2 to 3-fold lower than conjunctiva		
DEGs ≥ 1.5 to 2-fold higher than conjunctiva			DEGs ≥ 1.5 to 2-fold lower than conjunctiva		

Table S15. Oligonucleotide Primers used for qPCR

Gene	Forward Sequence	Reverse Sequence
<i>AATK</i>	ccgatttcctcaggtacagg	tgtacgtcctgccactca
<i>ATF4</i>	tcaaacctcatgggtctcc	gtgtcatccaacgtggtcag
<i>CHOP</i>	agaaccaggaaacggaaacaga	tctccttcacgcctgcttt
<i>COL1A1</i>	gaacgcgtgtcatccctgt	gaacgaggtagtcttcagcaaca
<i>DMBT1</i>	tgtgaggaagttggaatagtcg	ccagataacgccgaacct
<i>FN1</i>	agcggacctacntaggaat	ggtttcgatggtacagctt
<i>MUC7</i>	atgccttctgtgacgtagtc	atgaaaactctgccgtgt
<i>PITX1</i>	cgtagccaccttgac	ctaccccgacatgagcat
<i>POU5F1</i>	tgtgtctatctactgtgtccca	gttgaggaggaggtgaagttc
<i>PTN</i>	ctcctgtttcttcctcct	actgtcacctctccaagc
<i>SCGB3A1</i>	gcagcgtctgtcctcag	ctcatagagggtcccagaa
<i>SIX1</i>	accggaggcaaagagacc	ggagagagttggttctgctgt
<i>XPB1</i>	ctgagtcgaatcaggtgcag	atccatggggagatgttctgg
<i>GAPDH</i>	ggatgatgttctggagagcc	catcacatcttcaggagc