

## **Curriculum Vitae**

**G. ASTRID LIMB**  
*MSc, PhD, FRCPath*

### **1. Personal Details**

Name: Gloria Astrid Limb

Department: Institute of Ophthalmology

Present appointment: Principal Research Associate  
UCL Institute of Ophthalmology, UK

### **2. Education/Qualifications**

1979	MSc Medical Microbiology	Javeriana University, Colombia
1986	PhD Immunology	Brunel University, UK
2009	FRCPath	Royal College of Pathologists, UK

### **3. Positions held**

1996-1998	Thomas Pocklington Senior Research Fellow and Honorary Lecturer	UMDS, St Thomas' Hospital, London (now King's College)
1991-1996	Thomas Pocklington Research Fellow and Honorary Lecturer	UMDS, St Thomas' Hospital, London
1987-1990	Post-Doctoral Research Fellow	UMDS, St Thomas' Hospital, London

### **4. Affiliations**

#### *Membership of Learned Societies:*

- Fellow Royal College of Pathologists, UK
- Associate Principal Investigator of the European Stem Cell Group- EuroSyStem (1 of 15 European Associate PIs)
- Member American Association for Research in Vision and Ophthalmology (ARVO)
- Fellow Royal Society of Medicine
- Member British Society for Immunology
- Member International Society for Stem Cell Research
- Member International Society for Eye Research

#### *Editorial appointments:*

- Member of Publications Committee of the American Association for Research in Vision and Ophthalmology (ARVO)
- Editorial Board Member of *The Open Ophthalmology Journal* – appointed August 2007.

#### *Other extramural activities:*

- Adviser to the FP7-REGPOT programme to strengthen the research capacity of the University of Bogazici, Istanbul (2010-2012)
- American Association for Research in Vision and Ophthalmology (ARVO): Served in Volunteer's Management Committee. Period 2005-2008.

## 5. Prizes, Awards and other Honours:

<u>Dates</u>	<u>Detail of prize, award or honour</u>	<u>Awarding/electing body</u>
Sept 1996	Recognized teacher of Immunology	London University
July 2004	Founders Cup for best Research	Royal College of Ophthalmology
Feb 2008	Best Pitch presentation	MRC neuroscience Health Board Showcase

## 6. Teaching activity

Supervisor of MSc and PhD student projects at UCL. Examiner for PhD students at various UK Universities.

## 7. PUBLICATIONS LIST

- Bhatia B, Singhal S, Tadman DN, Khaw PT, **Limb GA**. (2010) SOX2 is required for adult human Müller stem cell survival and maintenance of progenicity in vitro. *Invest Ophthalmol Vis Sci*. Aug 25. [Epub ahead of print]
- Mansoor S, Gupta N, Luczy-Bachman G, **Limb GA**, Kuppermann BD, Kenney MC. (2010) Protective effects of memantine and epicatechin on catechol-induced toxicity on Müller cells in vitro. *Toxicology*. 271(3):107-14.
- Dahlmann-Noor AH, Vijay S, **Limb GA**, Khaw PT. (2010) Strategies for optic nerve rescue and regeneration in glaucoma and other optic neuropathies. *Drug Discov Today*. 15:287-99.
- Singhal S, Lawrence JM, Salt TE, Khaw PT, **Limb GA**. (2010) Triamcinolone attenuates macrophage/microglia accumulation associated with NMDA-induced RGC death and facilitates survival of Müller stem cell grafts. *Exp Eye Res*. 90:308-15.
- Bhatia B, Singhal S, Jayaram H, Khaw PT, **Limb GA**. (2010) Adult retinal stem cells revisited. *Open Ophthalmol J*. 4:30-8.
- Zong H, Ward M, Madden A, Yong PH, **Limb GA**, Curtis TM, Stitt AW. (2010) Hyperglycaemia-induced pro-inflammatory responses by retinal Müller glia are regulated by the receptor for advanced glycation end-products (RAGE). *Diabetologia*. Sep 12. [Epub ahead of print]
- Hollborn M, Ulbrich E, Rillich K, Dukic-Stefanovic S, Wurm A, Wagner L, Reichenbach A, Wiedemann P, **Limb GA**, Bringmann A, Kohlen L. (2010). The human Müller cell line MIO-M1 expresses opsins and is light-sensitive. *Invest. Ophthalmol. Vis. Sci*. [Epub ahead of print]
- Limb, GA., Ellis JS. Retinal repair and regeneration. In *Biomaterials and Regenerative Medicine in Ophthalmology*. Chapter 26. Edited by T. V. Chirila, Woodhead Publishing Ltd, Cambridge, UK. pp.374-389
- Limb, GA., Jayaram H. Regulatory and pathogenic roles of Müller Glial cells in retinal neovascular processes and their potential for retinal regeneration. In *Frontiers in Diabetes: 'Diabetic Retinopathy- An Update' Series* edited by Porta M and Hammes H-P. S. Karger AG. Germany. pp 98-108
- Notara, M.N., Du, Y., Limb, G.A., Funderburgh, J.L., Daniels, J.T. Ocular stem cell isolation and culture. In *Human cell culture*. Springer Verlag. Pp 113-142
- Bhatia B, Singhal S, Lawrence JM, Khaw PT, Limb GA. (2009) Distribution of Müller stem cells within the neural retina: evidence for the existence of a ciliary margin-like zone in the adult human eye. *Exp Eye Res*. 89:373-382.
- Burmeister SL, Hartwig D, Limb GA, Kremling C, Hoerauf H, Müller M, Geerling G. (2009) Effect of various platelet preparations on retinal Müller cells. *Invest Ophth. Vis Sci*. 50: 4881-4886.
- Bull, N.D., Limb, G.A., Martin, K.R. (2008). Human Müller stem cell (MIO-M1) transplantation in a rat model of glaucoma: survival, differentiation, and integration. *Invest Ophthalmol. Vis. Sci*. 49(8), 3449-3456
- Ghazi-Nouri, S.M., Ellis, J.S., Moss, S., Limb, G.A., Charteris, D.G. (2008). Expression and localisation of BDNF, NT4 and TrkB in proliferative vitreoretinopathy. *Exp. Eye Res*. 86(5), 819-827

- Limb,G.A., Daniels,J.T. (2008). Ocular regeneration by stem cells: present status and future prospects. *Br.Med.Bull.* 85, 47-61
- Sancho-Pelluz,J., Wunderlich,K.A., Rauch,U., Romero,F.J., van, Veen T., Limb,G.A., Crocker,P.R., Perez,M.T. (2008). Sialoadhesin Expression in Intact Degenerating Retinas and Following Transplantation. *Invest Ophthalmol.Vis.Sci.*
- Singhal,S., Lawrence,J.M., Bhatia,B., Ellis,J.S., Kwan,A.S., Macneil,A., Luthert,P.J., Fawcett,J.W., Perez,M.T., Khaw,P.T., Limb,G.A. (2008). Chondroitin sulfate proteoglycans and microglia prevent migration and integration of grafted Muller stem cells into degenerating retina. *Stem Cells* 26(4), 1074-1082
- Lawrence,J.M., Singhal,S., Bhatia,B., Keegan,D.J., Reh,T.A., Luthert,P.J., Khaw,P.T., Limb,G.A. (2007). MIO-M1 cells and similar muller glial cell lines derived from adult human retina exhibit neural stem cell characteristics. *Stem Cells* 25(8), 2033-2043. ISSN: 1066-5099
- Shortt,A.J., Secker,G.A., Notara,M.D., Limb,G.A., Khaw,P.T., Tuft,S.J., Daniels,J.T. (2007). Transplantation of ex vivo cultured limbal epithelial stem cells: a review of techniques and clinical results. *Surv.Ophthalmol.* 52(5), 483-502
- Limb,G.A., Daniels,J.T., Cambrey,A.D., Secker,G.A., Shortt,A.J., Lawrence,J.M., Khaw,P.T. (2006). Current prospects for adult stem cell-based therapies in ocular repair and regeneration. *Curr.Eye Res.* 31(5), 381-390
- Hollborn,M., Tenckhoff,S., Jahn,K., Iandiev,I., Biedermann,B., Schnurrbusch,U.E., Limb,G.A., Reichenbach,A., Wolf,S., Wiedemann,P., Kohen,L., Bringmann,A. (2005). Changes in retinal gene expression in proliferative vitreoretinopathy: glial cell expression of HB-EGF. *Mol.Vis.* 11, 397-413
- Limb,G.A., Matter,K., Murphy,G., Cambrey,A.D., Bishop,P.N., Morris,G.E., Khaw,P.T. (2005). Matrix metalloproteinase-1 associates with intracellular organelles and confers resistance to lamin A/C degradation during apoptosis. *Am J Pathol* 166(5), 1555-1563
- Asaria,R.H., Kon,C.H., Bunce,C., Sethi,C.S., Limb,G.A., Khaw,P.T., Aylward,G.W., Charteris,D.G. (2004). Silicone oil concentrates fibrogenic growth factors in the retro-oil fluid. *Br.J Ophthalmol.* 88(11), 1439-1442
- Hollborn,M., Jahn,K., Limb,G.A., Kohen,L., Wiedemann,P., Bringmann,A. (2004). Characterization of the basic fibroblast growth factor-evoked proliferation of the human Muller cell line, MIO-M1. *Graefes Arch.Clin.Exp.Ophthalmol.* 42(5), 414-422
- Hollborn,M., Krause,C., Iandiev,I., Yafai,Y., Tenckhoff,S., Bigl,M., Schnurrbusch,U.E., Limb,G.A., Reichenbach,A., Kohen,L., Wolf,S., Wiedemann,P., Bringmann,A. (2004). Glial cell expression of hepatocyte growth factor in vitreoretinal proliferative disease. *Lab Invest* 84(8), 963-972
- Daniels,J.T., Limb,G.A., Saarialho-Kere,U., Murphy,G., Khaw,P.T. (2003). Human corneal epithelial cells require MMP-1 for HGF-mediated migration on collagen I. *Invest Ophthalmol.Vis.Sci.* 44(3), 1048-1055
- Ghazi-Nouri,S.M., Assi,A., Limb,G.A., Scott,R.A., von, Bussmann K., Humphrey,I., Luthert,P.J., Charteris,D.G. (2003). Laser photocoagulation alters the pattern of staining for neurotrophin-4, GFAP, and CD68 in human retina. *Br.J Ophthalmol.* 87(4), 488-492
- Ghazi-Nouri,S.M., Assi,A., Limb,G.A., Scott,R.A.H., von Bussmann,K., Humphrey,I., Luthert,P.J., Charteris,D.G. (2002). Laser photocoagulation alters the pattern of staining for neurotrophin -4, GFAP and CD68 in human retina. *The British Journal of Ophthalmology* 87(4), 488-492. ISSN: 0007-1161
- Khaw,P.T., Cambrey,A.D., Limb,G.A., Daniels,J.T. (2002). Gene therapy: new "magic bullets" to prevent ocular scarring. *Br.J Ophthalmol.* 86(5), 490-492
- Limb,G.A., Daniels,J.T., Pleass,R., Charteris,D.G., Luthert,P.J., Khaw,P.T. (2002). Differential expression of matrix metalloproteinases 2 and 9 by glial Muller cells: response to soluble and extracellular matrix-bound tumor necrosis factor-alpha. *Am J Pathol* 160(5), 1847-1855
- Limb,G.A., Salt,T.E., Munro,P.M., Moss,S.E., Khaw,P.T. (2002). In vitro characterization of a spontaneously immortalized human Muller cell line (MIO-M1) *Invest Ophthalmol.Vis.Sci.* 43(3), 864-869
- Wong,T.T., Sethi,C., Daniels,J.T., Limb,G.A., Murphy,G., Khaw,P.T. (2002). Matrix metalloproteinases in disease and repair processes in the anterior segment. *Surv.Ophthalmol.* 47(3), 239-256

- Geerling,G., Limb,G.A., Daniels,J.T., Dart,J.K., Khaw,P.T. (2001). Immunolocalisation of matrix metalloproteinases and tissue inhibitors of metalloproteinases in sterile corneal ulcers. *Investigative Ophthalmology and Visual Science*, , 42, 3077
- Limb,G.A., Hollifield,R.D., Webster,L., Charteris,D.G., Chignell,A.H. (2001). Soluble TNF receptors in vitreoretinal proliferative disease. *Invest Ophthalmol.Vis.Sci.* 42(7), 1586-1591
- Limb,G.A., Daniels,J.T., Pleass,R., Blood,I., Charteris,D.G., Luthert,P.J., Khaw,P.T. (2001). Expression of MMP2 and MMP9 by retinal Muller cells: modulation by extracellular matrix-bound TNF alpha. *Investigative Ophthalmology and Visual Science*, , 42, 1077
- Limb,G.A., Hollifield,R.D., Webster,L., Charteris,D.G., Chignell,A.H. (2001). Soluble TNF receptors (sTNF-Rs) in vitreoretinal proliferative disease. *Investigative Ophthalmology & Visual Science* 42, 1586-1591. ISSN: 0146-0404
- Wong,T.T.L., Daniels,J.T., Limb,G.A., Murphy,G., Khaw,P.T. (2001). MMP1 and MMP2 are implicated in myofibroblast mediated collagen contraction. *Investigative Ophthalmology and Visual Science*, , 42, 2917
- Salzmann,J., Limb,G.A., Khaw,P.T., Gregor,Z.J., Webster,L., Chignell,A.H., Charteris,D.G. (2000). Matrix metalloproteinases and their natural inhibitors in fibrovascular membranes of proliferative diabetic retinopathy. *Br.J Ophthalmol.* 84(10), 1091-1096
- Guo,L., Hussain,A.A., Limb,G.A., Marshall,J. (1999). Age-dependent variation in metalloproteinase activity of isolated human Bruch's membrane and choroid. *Invest Ophthalmol.Vis.Sci.* 40(11), 2676-2682
- Limb,G.A., Chignell,A.H. (1999). Vitreous levels of intercellular adhesion molecule 1 (ICAM-1) as a risk indicator of proliferative vitreoretinopathy. *Br.J Ophthalmol.* 83(8), 953-956
- Limb,G.A., Hickman-Casey,J., Hollifield,R.D., Chignell,A.H. (1999). Vascular adhesion molecules in vitreous from eyes with proliferative diabetic retinopathy. *Invest Ophthalmol.Vis.Sci.* 40(10), 2453-2457
- Limb,G.A., Soomro,H., Janikoun,S., Hollifield,R.D., Shilling,J. (1999). Evidence for control of tumour necrosis factor-alpha (TNF-alpha) activity by TNF receptors in patients with proliferative diabetic retinopathy. *Clin.Exp.Immunol.* 115(3), 409-414
- Limb,G.A., Webster,L., Soomro,H., Janikoun,S., Shilling,J. (1999). Platelet expression of tumour necrosis factor-alpha (TNF-alpha), TNF receptors and intercellular adhesion molecule-1 (ICAM-1) in patients with proliferative diabetic retinopathy. *Clin.Exp.Immunol.* 118(2), 213-218
- Webster,L., Chignell,A.H., Limb,G.A. (1999). Predominance of MMP-1 and MMP-2 in epiretinal and subretinal membranes of proliferative vitreoretinopathy. *Exp.Eye Res.* 68(1), 91-98
- Ellis,R.D., Goodlad,J.R., Limb,G.A., Powell,J.J., Thompson,R.P., Punched,N.A. (1998). Activation of nuclear factor kappa B in Crohn's disease. *Inflamm.Res.* 47(11), 440-445
- Webster,L., Stanbury,R.M., Chignell,A.H., Limb,G.A. (1998). Vitreous intercellular adhesion molecule 1 in uveitis complicated by retinal detachment. *Br.J Ophthalmol.* 82(4), 438-443
- Ellis,R.D., Limb,G.A., Thompson,R.P., Punched,N.A. (1997). NF kappa B in Crohn's disease. *Biochem.Soc.Trans.* 25(2), 178S
- Limb,G.A., Chignell,A.H., Cole,C.J., Green,W.T., Webster,L., Hollifield,R.D., Dumonde,D.C. (1997). Intercellular adhesion molecule-1 in proliferative vitreoretinopathy. *Invest Ophthalmol.Vis.Sci.* 38(5), 1043-1048
- Limb,G.A., Cole,C.J., Earley,O., Hollifield,R.D., Russell,W., Stanford,M.R. (1997). Expression of hematopoietic cell markers by retinal pigment epithelial cells. *Curr.Eye Res.* 16(10), 985-991
- Russell,W., Hollifield,R.D., West,A.J., Stanford,M.R., Limb,G.A. (1997). Expression of haematopoietic cell markers by retinal pigment epithelial cells and Muller cells. *Biochem.Soc.Trans.* 25(2), 251S
- Webster,L., Abordo,E.A., Thornalley,P.J., Limb,G.A. (1997). Induction of TNF alpha and IL-1 beta mRNA in monocytes by methylglyoxal- and advanced glycated endproduct-modified human serum albumin. *Biochem.Soc.Trans.* 25(2), 250S
- Limb, G.A., Miller, K., Chignell, A.H., Williamson, T.H., Hollifield, R.D., Dumonde,D.C. (1997). Metalloproteinases and TIMP-1 in proliferative vitreoretinopathy. *Biochem.Soc.Trans.* 25(2), 234S

- Limb,G.A., Chignell,A.H., Green,W., LeRoy,F., Dumonde,D.C. (1996). Distribution of TNF alpha and its reactive vascular adhesion molecules in fibrovascular membranes of proliferative diabetic retinopathy. *Br.J Ophthalmol.* 80(2), 168-173
- Limb,G.A., Chignell,A.H., Woon,H., Green,W., Cole,C.J., Dumonde,D.C. (1996). Evidence of chronic inflammation in retina excised after relaxing retinotomy for anterior proliferative vitreoretinopathy. *Graefes Arch.Clin.Exp.Ophthalmol.* 234(4), 213-220
- Kontakou,M., Przemioslo,R.T., Sturgess,R.P., Limb,G.A., Ellis,H.J., Day,P., Ciclitira,P.J. (1995). Cytokine mRNA expression in the mucosa of treated coeliac patients after wheat peptide challenge. *Gut* 37(1), 52-57
- Kontakou, M., Przemioslo,R.T., Sturgess,R.P., Limb,G.A., Ciclitira,P.J. (1995). Expression of tumour necrosis factor-alpha, interleukin-6, and interleukin-2 mRNA in the jejunum of patients with celiac disease. *Scand. J. Gastroenterol.* 5:456-463
- Kontakou,M., Sturgess,R.P., Przemioslo,R.T., Limb,G.A., Nelufer,J.M., Ciclitira,P.J. (1994). Detection of interferon gamma mRNA in the mucosa of patients with coeliac disease by in situ hybridisation. *Gut* 35(8), 1037-1041
- Limb,G.A., Alam,A., Earley,O., Green,W., Chignell,A.H., Dumonde,D.C. (1994). Distribution of cytokine proteins within epiretinal membranes in proliferative vitreoretinopathy. *Curr.Eye Res.* 13(11), 791-798
- Limb,G.A., Earley,O., Jones,S.E., LeRoy,F., Chignell,A.H., Dumonde,D.C. (1994). Expression of mRNA coding for TNF alpha, IL-1 beta and IL-6 by cells infiltrating retinal membranes. *Graefes Arch.Clin.Exp.Ophthalmol.* 232(11), 646-651
- Galinanes,M., Lawson,C.S., Ferrari,R., Limb,G.A., Derias,N.W., Hearse,D.J. (1993). Early and late effects of leukopenic reperfusion on the recovery of cardiac contractile function. *Studies in the transplanted and isolated blood-perfused rat heart. Circulation* 88(2), 673-683 [
- Limb,G.A., Franks,W.A., Munasinghe,K.R., Chignell,A.H., Dumonde,D.C. (1993). Proliferative vitreoretinopathy: an examination of the involvement of lymphocytes, adhesion molecules and HLA-DR antigens. *Graefes Arch.Clin.Exp.Ophthalmol.* 231(6), 331-336
- Limb,G.A., Kapur,S., Woon,H., Franks,W.A., Jones,S.E., Chignell,A.H., Dumonde,D.C. (1993). Expression of mRNA for interleukin 6 by cells infiltrating epiretinal membranes in proliferative vitreoretinopathy. *Agents Actions* 38 Spec No, C73-C76
- Franks,W.A., Limb,G.A., Stanford,M.R., Ogilvie,J., Wolstencroft,R.A., Chignell,A.H., Dumonde,D.C. (1992). Cytokines in human intraocular inflammation. *Curr.Eye Res.* 11 Suppl, 187-191
- Limb,G.A., Hamblin,A.S., Wolstencroft,R.A., Dumonde,D.C. (1992). Rapid cytokine up-regulation of integrins, complement receptor 1 and HLA-DR on monocytes but not on lymphocytes. *Immunology* 77(1), 88-94
- Anstey,A.V., Arlett,C.F., Cole,J., Norris,P.G., Hamblin,A.S., Limb,G.A., Lehmann,A.R., Wilkinson,J.D., Turner,M. (1991). Long-term survival and preservation of natural killer cell activity in a xeroderma pigmentosum patient with spontaneous regression and multiple deposits of malignant melanoma. *Br.J Dermatol.* 125(3), 272-278
- Limb,G.A., Hamblin,A.S., Wolstencroft,R.A., Dumonde,D.C. (1991). Selective up-regulation of human granulocyte integrins and complement receptor 1 by cytokines. *Immunology* 74(4), 696-702
- Limb,G.A., Little,B.C., Meager,A., Ogilvie,J.A., Wolstencroft,R.A., Franks,W.A., Chignell,A.H., Dumonde,D.C. (1991). Cytokines in proliferative vitreoretinopathy. *Eye* 5 ( Pt 6), 686-693
- Norris,P.G., Limb,G.A., Hamblin,A.S., Lehmann,A.R., Arlett,C.F., Cole,J., Waugh,A.P., Hawk,J.L. (1990). Immune function, mutant frequency, and cancer risk in the DNA repair defective genodermatoses xeroderma pigmentosum, Cockayne's syndrome, and trichothiodystrophy. *J Invest Dermatol.* 94(1), 94-100
- Limb,G.A., Brown,K.A., Wolstencroft,R.A., Ellis,B.A., Dumonde,D.C. (1989). The production of arthritis in the guinea-pig by intra-articular reaction between lymphokines and inflammatory leucocytes. *Br.J Exp.Pathol* 70(4), 443-456
- Limb,G.A., Meager,A., Woolley,J., Wadhwa,M., Biggerstaff,J., Brown,K.A., Wolstencroft,R.A. (1989). Release of cytokines during generation of lymphokine-activated killer (LAK) cells by IL-2. *Immunology* 68(4), 514-519

- Fagan, E.A., Pulley, M., Limb, G.A., Wolstencroft, R., Cranenburgh, C., De Vinci, C., Karani, J., Michell, M., Nunnerley, H., Zaman, S., Dumonde, D.C. (1989). Adoptive immunotherapy administered via the hepatic artery and intralesional interleukin-2 in hepatocellular carcinoma. *Cancer Treat Rev. Suppl A*: 151-160
- Jenkins, R., Williams, A.C., Limb, G.A., Brown, K.A., Dumonde, D.C. (1988). Interleukin-2 induced changes in mononuclear cell surface charge. *Adv. Exp. Med. Biol.* 237, 433-438
- Limb, G.A., Brown, K.A., Wolstencroft, R.A., Dumonde, D.C. (1988). Shedding and synthesis de novo of Fc and C3b receptors by cultured guinea-pig macrophages. *Clin. Exp. Immunol.* 71(2), 362-367
- Norris, P.G., Limb, G.A., Hamblin, A.S., Hawk, J.L. (1988). Impairment of natural-killer-cell activity in xeroderma pigmentosum. *N. Engl. J. Med.* 319(25), 1668-1669