

(i) Name

John H.K. Liu, PhD

(ii) Academic qualifications

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
National Taiwan University, Taipei, Taiwan	Pharmacy	06/1973	Pharmacy
National Tsing Hua University, Hsinchu, Taiwan	M.S.	06/1977	Molecular Biology
Texas A&M University, College Station, Texas	PhD	05/1981	Pharmacology
Harvard Medical School, Boston, Massachusetts	Postdoctoral	1981-1983	Ophthalmology

(iii) Previous academic positions held

1983-1988 Assistant Scientist, Schepens Eye Research Institute, Harvard Medical School
1988-1991 Associate Scientist, Schepens Eye Research Institute, Harvard Medical School
1991-2000 Associate Professor in Residence, Department of Ophthalmology, UCSD
2000-2014 Adjunct Professor, Department of Ophthalmology, UCSD

(iv) Present academic position

1992- Faculty member, Graduate Program in Neurosciences, UCSD
2004- Faculty member, Sam and Rose Stein Institute for Research on Aging, UCSD
2008- Faculty member, Institute of Engineering in Medicine, UCSD
2010- Faculty member, Clinical and Translational Research Institute, UCSD
2014- Professor (recalled), Department of Ophthalmology, UCSD

(v) Previous relevant research work

1. Circadian rhythm of intraocular pressure (IOP)

From my training in graduate school to the years of 1996-1998, I did biochemical research on signal transduction using ocular tissues involved in the regulation of IOP. I also did *in vivo* physiological research on neural and hormonal regulation of IOP in various animal species. These works led me to concentrate my research on the circadian (24-hour) rhythm of IOP.

2. 24-hour IOP variations in humans

Having known that our knowledge of 24-hour IOP in humans was insufficient, I began to organize a research team 1996-1998 to work on 24-hour IOP in humans using the campus sleep laboratory at UCSD. The emphasis was on the nocturnal IOP in various clinical conditions including healthy eyes, eyes with ocular hypertension, untreated glaucomatous eyes and eyes treated with glaucoma medications and laser surgery. Our works provided the foundation for others to commercialize the first human 24-hour IOP monitor using a contact lens based biosensor.

3. Ocular and brain pressures during spaceflight

For the past several years, I have been participating in research studies to understand mechanisms of spaceflight associated neuro-ocular syndrome (SANS, also called VIIP, visual impairment intracranial pressure) in astronauts/cosmonauts during their spaceflights in the International Space Station. Our initial works in this new research field were summarized in a book “Intracranial Pressure and Its Effect on Vision in Space and on Earth”. I proposed a unified pressure theory that links this spaceflight caused syndrome to eye diseases. Test of this hypothesis is ongoing in the International Space Station. We plan to report data collected from the International Space Station within a year or two.

4. Eyedrop usage compliance

Lately, I have been increasingly interested in the compliance of eyedrop usage. After intensive literature research plus my experience in working with the wireless contact lens based IOP sensor, a concept of using a punctal biosensor sensing ocular surface temperature was developed for monitoring the compliance. A provisional patent application was filed in May, 2017 and a full PCT (patent cooperation treaty) patent application was filed in May, 2018 with supporting data. A licensing agreement was signed between UCSD and Toromedes in June, 2018 for an effort to develop the invention into a commercial product.

(vi) Publication records

Section A

1. Liu JHK, Weinreb RN. Posture, intraocular pressure and visual function. *Br J Ophthalmol* 2014;98:288-289.
2. Liu JHK, Mansouri K, Weinreb RN. Estimation of 24-hour intraocular pressure peak timing and variation using a contact lens sensor. *PLoS One* 2015;10:e0129529.
3. Liu JHK, Slight JR, Vittitow JL, Scassellati Sforzolini B, Weinreb RN. Efficacy of latanoprostene bunod 0.024% compared with timolol 0.5% in lowering intraocular pressure over 24 hours. *Am J Ophthalmol* 2016;169:249-257.
4. Liu JHK. A pressure theory links the VIIP syndrome and eye diseases. In “*Intracranial Pressure and Its Effect on Vision in Space and on Earth: Vision impairment in Space*”. (Eds. Macias BR, Liu JHK, Otto C, Hargens AR). pp. 273-287. World Scientific Publishing, Singapore, 2017.
5. Balasubramanian S, Tepelus T, Stenger MB, Lee SMC, Laurie SS, Liu JHK, Feiveson AH, Sadda SR, Huang AS, Macias BR. Thigh cuffs as a countermeasure for ocular changes in simulated weightlessness. *Ophthalmology* 2018;125:459-460.

Section B

1. Liu JHK, Realini T, Weinreb RN. Asymmetry of 24-hour intraocular pressure reduction by topical ocular hypotensive medications in fellow eyes. *Ophthalmology* 2011;118:1995-2000.
2. Liu JHK, Sit AJ, Weinreb RN. Variation of 24-hour intraocular pressure in healthy individuals: right eye versus left eye. *Ophthalmology* 2005;112:1670-1675.
3. Liu JHK, Kripke DF, Weinreb RN. Comparison of the nocturnal effects of once-daily timolol and latanoprost on intraocular pressure. *Am J Ophthalmol* 2004;138:389-395.
4. Liu JHK, Zhang X, Kripke DF, Weinreb RN. Twenty-four-hour intraocular pressure pattern associated with early glaucomatous changes. *Invest Ophthalmol Vis Sci* 2003;44:1586-1590.
5. Liu JHK. Circadian rhythm of intraocular pressure. *J Glaucoma* 1998;7:141-147.