BIOGRAPHICAL SKETCH

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NAME Beth Ann Benetz	POSITION TITLE Professor, CWRU Department of Ophthalmology and Visual Sciences
eRA COMMONS USER NAME **BABENETZ**	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Rochester Institute of Technology, Rochester, NY	BS	1988	Biomedical Photography
Duke University, Durham, NC	MA	1993	Liberal Studies

A. Personal Statement

Beth Ann Benetz is Professor, CWRU Department of Ophthalmology and Visual Sciences. She has been a faculty member in the CWRU Department of Ophthalmology and Visual Sciences since 1994. She developed and co-directed the Imaging Core module on the P30 Core grant to the University and held that position from 2002 - 2007. She has been involved in several successful collaborative efforts, most relevant to this proposal, the Case Cornea Image Analysis Reading Center (CIARC) collaborations with the Jaeb Center for Health Research for the Corneal Donor Study: Specular Microscopy Ancillary Study, the supplement for morphometric analysis of SMAS images as well as more recently as Director of the CIARC for the U10 funded Cornea Preservation Time Study (CPTS), examining graft success and cell loss following Descemet Stripping Endothelial Keratoplasty as related to preservation time in over 1000 patients at 40 clinical sites around the country. She has served as the Scientific Director for University Hospitals Eye Image Analysis Reading Centers, including CIARC, the reading center for SMAS and the CPTS, and numerous corporate studies since 1999. She has developed and implemented extensive operating procedures for the reading center activities. Her research interests focus on ophthalmic image analyses methods and development of specialized analytics software as well as imaging and analyses standardization and reproducibility. Specific interest in corneal transplant studies and improvements in the analyses methods related to both clinical and eye bank image capture and assessment began with her involvement with the SMAS and continued with her efforts with the CPTS.

B. Positions and Honor

Positions:

1988 – 1994 Ophthalmic Photographer, Duke University Eye Center, Durham, NC
1994 – 1997 Instructor of Ophthalmology, Case Western Reserve University, School of Medicine, Cleveland, OH
1994 – 2011 Director, Ophthalmic Photography/Imaging Services, Case Western Reserve University, School of Medicine and University Hospitals Case Medical Center, Cleveland, OH
1997 – 2001 Senior Instructor of Ophthalmology, Case Western Reserve University, School of Medicine, Cleveland, OH

1999 – 2016 Technical Director, Retinal Diseases Image Analysis Reading Center, University Hospitals Eye Institute, Cleveland, OH
1999 – 2016 Technical Director, Cornea Image Analysis Reading Center, University Hospitals Eye Institute, Cleveland, OH
2001 – 2007 Assistant Professor of Ophthalmology, Case Western Reserve University, School of Medicine, Cleveland, OH
2007 – 2013 Associate Professor of Ophthalmology, Case Western Reserve University, School of Medicine, Cleveland, OH
2013 – Professor of Ophthalmology, Case Western Reserve University, School of Medicine, Cleveland, OH
2016 – Scientific Director, Cornea Image Analysis Reading. University Hospitals Eye Institute, Cleveland, OH
2016 – Scientific Director, Retina Diseases Image Analysis Reading Center. University Hospitals Eye Institute, Cleveland, OH

Honors
2006   Fellowship, Ophthalmic Photographers Society

Board Service and Review Panel Service:
1994-2014   Board of Certification, Ophthalmic Photographers' Society

C. Contribution to Science
Beth Ann Benetz, as an ophthalmic imaging and analyses expert has made contribution in standardization of ophthalmic imaging techniques, image quality and image analysis for both the ophthalmic clinical and eye bank settings. In particular, Benetz's clinical trials work as technical director leading the analyses efforts of the Cornea Image Analysis Reading Center (CIARC) with the NEI funded Cornea Donor Study (CDS) and the Specular Microscopy Ancillary Study (SMAS) has resulted in major discoveries surrounding the factors influencing graft success and endothelial cell loss following penetrating keratoplasty (PKP). These discoveries include that the baseline cell count does not influence graft failure, while the 6 month cell count does. Donor age does not influence graft failure and cell loss for the majority of donors (34 to 72 years).

1. Lass JH, Riddlesworth TD, Gal RL, Kollman C, **Benetz BA** et al: The Effect of Diabetes on Graft Failure and Endothelial Cell Density Ten Years after Penetrating Keratoplasty. Ophthalmology 122:448-56, 2015.
2. Riddlesworth TD, Kollman C**,** Lass JH, Patel SV, Stulting RD, **Benetz BA** et al: A Mathematical Model to Predict Endothelial Cell Density Following Penetrating Keratoplasty with Selective Dropout from Graft Failure. IOVS 55:8409-15, 2014.
3. Lass JH, Gal R, **Benetz BA** et al: Donor age and factors related to endothelial cell loss ten years after penetrating keratoplasty: Specular Microscopy Ancillary Study.   Ophthalmology 120:2428-35, 2013.
4. **Benetz BA**, Lass JH, Gal RL, Sugar A, Menegay H, Dontchev M, Kollman C, Beck RW, Mannis MJ, Holland EJ, Gorovoy M, Hannush SB, Bokosky JE, Caudill JW; Cornea Donor Study Investigator Group. Endothelial morphometric measures to predict endothelial graft failure after penetrating keratoplasty. JAMA Ophthalmol. 2013 May;131(5):601-8.
5. Lass JH, Mannis MJ, Sugar A, **Benetz BA**, Beck RW, Donchev M, Gal, RL, Kollman C, Holland EJ, PriceFW, Jr., Heck E, Raber I, Stark W, Stulting RD for the Cornea Donor Study Investigator Group: Baseline factors related to endothelial cell loss following penetrating keratoplasty. Arch Ophthalmol 129:1149-54, 2011.

6. Lass JH, Gal RL, Dontchev M, and the Cornea Donor Study Investigator Group: Donor age and corneal endothelial cell loss five years after successful corneal transplantation: Specular Microscopy Ancillary Study results. Ophthalmology 115:627-32, 2008.
7. Lass JH, Sugar A, **Benetz BA**, Beck RW, Dontchev M, Gal RL, Kollmann C, Gross R, Heck E, Holland EJ, Mannis MJ, Raber I, Stark W, Stulting RD, on behalf of the Cornea Donor Investigator Group. Endothelial cell density predictive of endothelial graft failure after corneal transplantation. Arch Ophthalmol 128:63-69, 2010.
8. **Benetz BA**, Gal RL, Ruedy KJ, Rice C, Beck RW, Kalajian AD, Lass JH; Cornea Donor Study Group. Specular microscopy ancillary study methods for donor endothelial cell density determination of Cornea Donor Study images. Curr Eye Res. 31(4):319-27, 2006.

Her clinical trials work continued as central reading center director of the NEI funded Cornea Preservation Time Study (CPTS) between 2011 and 2018. The primary manuscript related to corneal endothelial cell loss released in December 2017 should have significant impact to extend PT 3-4 more days beyond current practice. In addition, her continued emphasis on eye bank endothelial image equality and analyses accuracy impacts related eye bank training, practice and standard setting.

Lass JH, **Benetz BA**, Verdier DD, et al. Corneal endothelial cell loss 3 years after successful Descemet's Stripping Automated Endothelial Keratoplasty in the Cornea Preservation Time Study. *JAMA Ophthalmology* 135:1394-1400, 2017 PMID 29127432

Stulting RD, Lass JH, Terry MA, **Benetz BA**, Cohen NJ, Ayala AR, Maguire MG, Croasdale C, Daoud Y, Dunn SP, Goins KM, Gupta PC, Macsai MS, Mian SI, Pramanik S, Rose-Nussbaumer J, Song JC, Stark WJ, Sugar A, Verdier DD, Szczotka-Flynn LB. Factors Associated With Graft Rejection in the Cornea Preservation Time Study. Am J Ophthalmol. 2018; 196:197-207. PMCID PMC6258266.

Patel SV, Lass JH, **Benetz BA**, et al. Post-operative endothelial cell density is associated with late endothelial graft failure after Descemet stripping automated endothelial keratoplasty. *Ophthalmology* published online February 18, 2019 PMID 30790587

Lass JH, **Benetz BA**, Patel SV, et al. Donor, Recipient, and Operative Factors Influencing Endothelial Cell Loss in the Cornea Preservation Time Study. *JAMA Ophthalmology* 137:185-193, 2019 PMID 30422157

Other papers directly relevant to the grant proposal

Benetz, BA Comparison of donor cornea endothelial cell density determined by eye banks and by a centralized reading center in the Cornea Preservation Time Study. *Cornea*. 38:426-32, 2019 PMID 30664048

Most recently, in collaboration with David Wilson in the CWRU Biomedical Engineering Department, she will utilize deep learning and image analytics on post-transplant corneal endothelial cell images to predict corneal keratoplasty failure. This work is funded through an R21 NEI research grant for vision related secondary data analysis and will utilize the images from the CPTS study.

Complete List of Published Work in MyBibliography:
http://www.ncbi.nlm.nih.gov/pubmed/?term=benetz+b

D. Research Support

Ongoing Research Support
"Image analytics prediction of corneal keratoplasty failure."
Co-Investigators: David Wilson and Beth Ann Benetz
Agency: National Eye Institute Type: R21 EY029498-01 09/18 – 08/20

Completed Research Support

"Cornea Donor Study--Specular Microscopy Ancillary Study".
Reading Center Technical Director: Beth Ann Benetz
Agency: National Eye Institute: U10 (EY12728) Period: 7/04 – 7/14
The major goal of this study was to examine the effect of donor age on graft failure and cell loss up to 10 years following penetrating keratoplasty.

"Effect of Corneal Preservation Time on Long-Term Graft Success (CPTS)"
Reading Center Director: Beth Ann Benetz
Agency: National Eye Institute Type: U10 (EY020798-01A1)   Period: 9/11 – 8/18
The major goal was to determine whether preservation time is an important determinant for corneal graft survival and endothelial cell density three year following surgery.