Financial Disclosures 2021 – 2022

None relevant to presentation

Other financial relations:
• Wolters Kluwer Health
• NSF AWD010114 (MPI Argento & Moroi)
• R01 EY022124 (PI Moroi)
• R21 EY030363 (MPI Musch & Moroi)
• R01 EY025752 (PI Komaromy)
Strategic Vision: Where are we? What are the key challenges & opportunities?

Sayoko Moroi, MD, PhD

Chair & William H. Havener, MD Endowed Professor
Biomechanics & Imaging

Biomechanics

• Cornea biomechanics: develop biomechanical markers of disease (glaucoma, ocular hypertension, diabetes, keratoconus vs normal)

• Model optic nerve damage by combing intraocular pulsations with cerebrospinal fluid pressure across the lamina cribrosa

Imaging with

• ANTERION (anterior segment OCT with axial length measurement) provide reference markers for imaging that can be used to calculate biomechanics

• Flex Arm OCT with acquisition in sitting, supine, and Trendelenburg provide measurement of translaminar cribrosa gradient

• Corneal and Ocular Wavefront Analysis with high spatial resolution to assess index of refraction

• Corneal Tomography and Topography provide precision to assess keratoconus treatment outcomes
Biomechanical Imaging -- PI: Jun Liu, PhD

- Optic Nerve
- Retina
- Sclera
- Lamina Cribrosa

Out-of-Plane Shear

Displacement

Strain

-5% 0% 5%
Ocular cancer genetics

1- Identify genes associated with hereditary predisposition to uveal melanoma.

2- Clinical spectrum & management of BAP1-tumor predisposition syndrome (co-leader of the BAP1 international consortium).

3- Role of BAP1 in tumorigenesis of different cancers.

4- Molecular mechanisms of sexual dimorphism in cancer.

Molecular mechanisms of ocular pigmentation in various eye diseases (uveal melanoma, AMD, toxic retinal injury and retinal detachment).
Uveal Melanoma

• What causes uveal melanoma?
  • BAP1 Tumor Predisposition Syndrome
• The Cancer Genome Atlas Project (TCGA) for Uveal Melanoma
• How can we better treat metastatic disease?
  • Crizotinib adjuvant clinical trial
• Long vs short survivors – why?
  • Genetic and inflammatory mechanisms
• OSU – Ocular Oncology Study Group
• BIG Consortium

Animal models of retinal detachment (RD):
• Mouse & chick
• Inflammatory mechanisms of retinal cell death / scarring
• Targets for therapy (proteins & genes)

Macrophage migration inhibitory factor (MIF):
• Neuroprotection of photoreceptors & reduces scarring
• MIF gene variations of epiretinal membrane vs proliferative vitreoretinopathy
High Resolution Optical Imaging of the Human Retina

- No dyes or contrast agents
- Pupil dilation / paralyze accommodation only
- Visible imaging wavelengths
- Use Adaptive Optics (AO) to correct for all of the optical distortions in the eye

AO-OCT-SLO in Rm. 5011 Havener
Our research goals are to advance our understanding of the genetic architecture of complex human diseases / traits, e.g. glaucoma and intraocular pressure, and to improve our ability to predict disease, target prevention to high-risk individuals and tailor treatment based on individual genomic differences.

**Genome-wide association studies**

In multi-ethnic populations
Glaucoma, IOP, VCDR, CCT, etc.
Ocular Biomaterials Research:
• Age-related vitreous liquefaction
• Injectable hydrogel biomimetic vitreous substitutes
• Controlled release of therapeutic agents to prevent oxidative damage
• Lens epithelial cell (LEC) response to biomaterials
• IOL design to prevent posterior capsule opacification

Ocular Drug Delivery Research:
• Biodegradable injectable implants
• Drug delivery systems for macular degeneration
• Corneal drug delivery
• Treatments for traumatic optic neuropathy
Ocular Aging and Trauma Laboratory
PI: Reilly; Applying engineering principles to prevention, diagnosis, and treatment of visual problems arising from age or trauma

Biomechanics, Mechanobiology, and Biochemistry of the Aging Lens
Precision Medicine

PI: Sayoko Moroi, MD, PhD

Goals:
1) variations in eye pressure and glaucoma drug response (EY022124)
2) gene therapy approaches for the trabecular meshwork (EY025752)
3) the biomechanics of peri-limbal scleral and aqueous veins (NSF 1760291)
4) interplay between vision, fear of falling, and falls in ‘SWAN’ (EY030363)
Molecular pathways of retina scarring – Shigeo Tamiya, PhD

• Cell studies on fibroblast cells and myocardin-related transcription factor (MRTF) [cartoon from Velasquez LS et al, PNAS 110:16850, 2013]
• ‘Druggable targets’ for proliferative vitreoretinopathy
Innate Immune Pathways:

• Inflammasome
• DNA sensor cGAS
• ‘druggable’ targets NLRP3 & cGAS
• telomerase

Laser model of neovascularization:

• VEGF & telomerase cross talk
• Angiogenesis transcriptome profiling
• ‘druggable’ anti-oligos or small molecules
One of the nation’s largest, most collaborative and diverse academic health care centers

33rd Best medical research college – USNWR
7th Most Diverse Medical School – USNWR
7 top ranked health science colleges
8 nationally renowned hospitals

$300M in research funding
3rd largest cancer hospital
340+ cancer researchers

1.87M outpatient visits
3rd largest university in the country
20 research centers
25 core labs

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• Harness data
• Analyze data (artificial intelligence/machine learning)
• Break barriers of health disparities
• Prevent blindness
Thank you for your attention