SINGAPORE EYE RESEARCH INSTITUTE

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Quarterly Newsletter

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SingHealth

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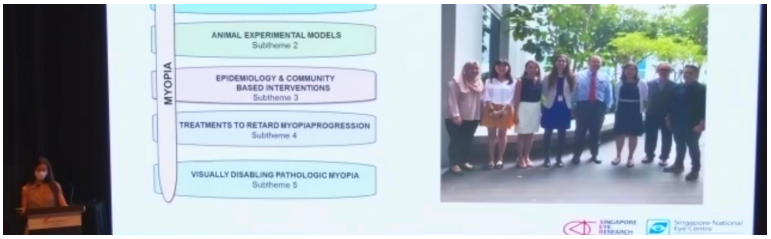
SNEC/SERI CELEBRATES ITS 1ST RESEARCH DAY 2021 IN A FIRST-OF-ITS-KIND HYBRID EVENT, HELD IN THE AUDITORIUM AND ON ZOOM

SERI celebrated its first-ever **SNEC/SERI Research day** on 19th March 2021. It was a first-of-its-kind hybrid event with audience joining live at the SERI auditorium and online via Zoom. This was a unique way of connecting with all our staff, while still adhering to the social distance norms and safety precautions.

The research day program involved participation from both the clinicians, research faculty, staff and post-docs and was immensely engaging and enjoyable.

The **opening address** by Prof Wong Tien Yin, Professor & Medical Director of SNEC/SERI on "Why Research is Critical for SNEC-SERI" was very insightful and gave us an overview of where we are today, how to remain relevant and what we need to do to maintain our international standards moving forward.

It was followed by an **International Keynote Address** by the Deputy Director of Centre for Eye Research Australia (CERA) and Professor of Ophthalmology, **Prof Robyn Guymer**, who joined us via Zoom from Melbourne to give a 5-Year Update of the LEAD study on laser Rx in iAMD.



SERI's latest research and highlights were discussed in the **3-minute Showcase your Research** section, where faculty and post-docs from different research groups, showcased their lab's work, while giving us a chance to keep abreast of their latest research.

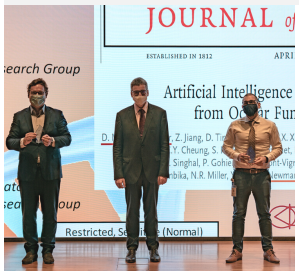
A very informal and a honest-sharing session by Neuro-ophthalmologist and Clinician-scientist Prof Dan Milea on "**Stumbling into my Research Career**" certainly lightened up the conversations while serving as a guide for the younger clinicians and scientists on how to navigate their career in research. Prof Dan spoke from his personal experiences and suggested the young researchers to choose their research topic, target, collaborators and values wisely.

A very unique segment on **SNEC/SERI Women In Science** hosted by A/Prof Eranga Vithana and consisting of women panelists - Dr Vidhya Lakshmi Venkatramani, Dr Carla Lanca, Prof Saw Seang Mei, Dr Rachel Chong and Dr Shweta Singhal paved the way for several interesting discusssions about imposter syndrome, the challenges and struggles women face in the field of science and how we could change the status-quo. A/Prof Eranga summarised the session well with her words, "*We don't want positive discrimination, but equal opportunities.*"

The Research Day program concluded with the most awaited **Research Day awards** for the **Top 5 Scientific Research Publications Award (winners pics and information below)** and the **Richard Fan Gold Medal**. The Richard Fan Gold medal was given to the Outstanding senior resident of 2021, Dr Beau James Fenner, Associate consultant at SNEC.

In conclusion, SERI's Executive Director, Prof Aung Tin praised all the SERI researchers for their outstanding research work over the years and lauded all the participants of the SNEC/SERI RESEARCH day. He sincerely thanked the organizing committee for making this event a grand success!

TOP 5 SCIENTIFIC RESEARCH PUBLICATIONS AWARD



PROF DAN MILEA & DR RAYMOND NAJJAR

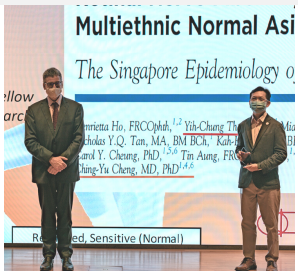
Paper: Artificial Intelligence to Detect Papilledema from Ocular Fundus Photographs

Published in: *New England Journal of Medicine*

DR ONG HON SHING

Paper: Meibomian gland dysfunction is the primary determinant of dry eye symptoms: Analysis of 2346 patients

Published in: *The Ocular Surface*



DR THAM YIH CHUNG

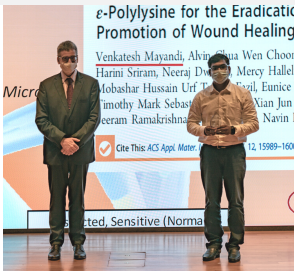
Paper: Retinal Nerve Fiber Layer Thickness in a Multiethnic Normal Asian Population: The Singapore Epidemiology of Eye Diseases Study

Published in: *Ophthalmology*

DR SEET LI FONG

Paper: Valproic acid exerts specific cellular and molecular anti-inflammatory effects in post-operative conjunctiva

Published in: *Journal of Molecular Medicine*



MR VENKATESH MAYANDI

Paper: Multifunctional Antimicrobial Nanofiber Dressings Containing ε-Polylysine for the Eradication of Bacterial Bioburden and Promotion of Wound Healing in Critically Colonized Wounds

Published in: Applied Materials & Interfaces

SCIENTISTS IDENTIFY GENETIC MUTATION ASSOCIATED WITH EXFOLIATIVE SYNDROME, THE MOST COMMON CAUSE OF GLAUCOMA

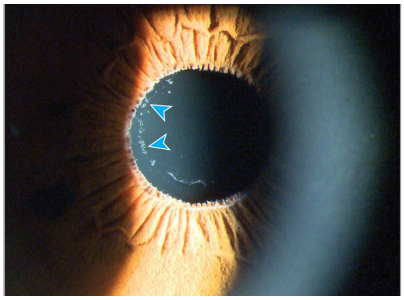


Figure:The typical white exfoliation material deposits on the surface of the lens are visible (blue arrows) .

A team of researchers from SERI and A*STAR have identified a genetic mutation associated with exfoliation syndrome, the most common cause of glaucoma. Their research was published in *Journal of the American Medical Association (JAMA)* in Feb 2021.

In this multi-center, whole-exome sequencing study that included 20,441 participants from 14 countries across Asia, Europe, and Africa, including more than 1,200 Singaporeans, it was seen that patients with exfoliation syndrome were more likely to be carriers of the functionally deficient CYP39A1 gene.

Exfoliation syndrome is a systemic disorder characterised by abnormal protein material that gets accumulated in front of the eye. This disorder is the most common cause of glaucoma, and a major cause of irreversible blindness.

The study showed that people with exfoliation syndrome were twice as likely to carry damaging mutations in the gene encoding for the CYP39A1 protein, an enzyme which plays an important role in the processing of cholesterol. This may lead to abnormalities in cholesterol homeostasis and transport, resulting in excess cholesterol accumulation in extracellular aggregates of exfoliation material, which is the hallmark of the disease.

The findings could pave the way for future research on the cause of exfoliation syndrome and potential cures.

NRF2 AND ITS ROLE IN THE PATHOGENESIS OF FUCHS' ENDOTHELIAL CORNEAL DYSTROPHY

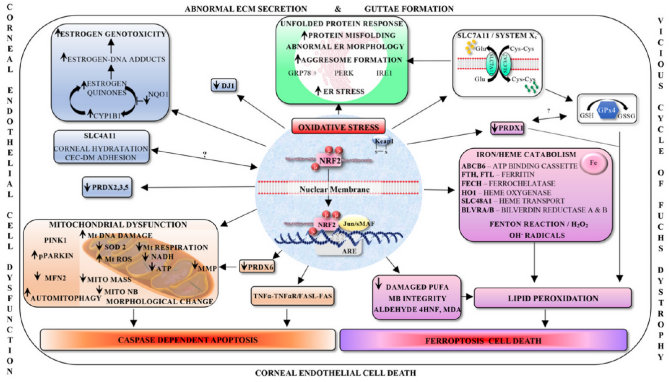


Figure: Schematic depicting roles for Nrf2 in regulating the functioning of corneal endothelial cells (CECs).

Nuclear factor, erythroid 2 like 2, Nrf2 is a transcription factor that regulates the expression of many genes encoding antioxidants and protects against oxidative stress. Since oxygen is utilized by most tissues in the body for cellular metabolism, free radicals and reactive oxygen species are produced in abundance as a natural by-product, which if not quenched, leads to cell and DNA damage.

Nrf2 is one such factor that regulates antioxidants that are vital for cytoprotection. Loss of Nrf2 has been attributed to several neurodegenerative diseases in humans. Cornea is one such organ that is constantly exposed to pollutants and UV radiations and is known to be under oxidative stress. A new review paper published by Prof Jodhbir S. Mehta's group in the journal *Redox Biology* focusses on the role of Nrf2 in regulating homeostasis in the cornea, with an emphasis on a late onset, blinding corneal disease known as Fuchs endothelial corneal dystrophy (FECD).

Clinical features of FECD include distinct outgrowth of extracellular matrix termed "Guttae" on the Descemet's membrane (DM), scar formation, loss of corneal endothelial cells (CECs) and corneal edema leading to loss of corneal clarity.

Despite clinical and scientific advances in understanding the pathogenesis of FECD, surgical intervention in the form a corneal transplantation is the only suitable therapy for advanced stage FECD.

The authors have discussed in depth about the role of oxidative stress in the pathogenesis of FECD, especially the transcription factor Nrf2, which has been shown in several studies to be crucial in regulating oxidative stress in CECs. Studies have confirmed that Nrf2 protein levels are significantly reduced in FECD-CECs compared to normal controls.

The authors suggest that the underlying phenotype in Fuchs endothelial corneal dystrophy (FECD) is an imbalance in oxidative stress caused due to a significant decrease in the expression of Nrf2 in CECs.

This loss of Nrf2 activity triggers a multitude of responses culminating in mitochondrial dysfunction, DNA damage, excessive lipid peroxidation and ultimately cell death. They conclude that the use of pharmacological targeting to restore Nrf2 expression should be explored as a therapy for FECD.

MEIBOMIAN GLAND DYSFUNCTION IS THE PRIMARY DETERMINANT OF DRY EYE SYMPTOMS: ANALYSIS OF 2346 PATIENTS

Defect in the quality or quantity of tear leads to a condition called dry eye. Patients suffer from irritated, gritty, scratchy, burning sensations, with redness, swelling and pain in the eyes, and visual blurring affecting daily activities such as driving etc. Dry eye (including milder cases) affects up to one third of the adult population.

A study by Dr Ong Hon Shing and Prof Louis Tong's group evaluated the relative contributions of various ocular surface clinical signs and predisposing factors to the magnitude of dry eye symptoms on 2346 patients who were referred for dry eye service from July 2006 to September 2019. It was published in the journal *The Ocular Surface.*

The diagnosis of dry eye requires assessment of clinical signs and symptoms. The study showed that higher ocular surface symptoms were associated with fewer normal liquid meibum expressing glands and an increase in forniceal papillary grading scores.

Meibomian glands are the tiny oil-producing glands which line the margin of the eyelids and keeps the water component of our tears from evaporating.

The results of this cross-sectional study show that Meibomian gland dysfunction (MGD) and lower forniceal papillary reaction had significant contributions to the severity of dry eye symptoms. It further suggests that meibomian gland dysfunction should be objectively assessed and treated to improve dry eye symptoms.

WOMEN IN VISION

8 Women's Day

Prof Tina Wong,
Director, Clinical Translational Research;
Head, Ocular Therapeutics &
Drug Delivery Research Group

What excites you, about your job?

My job is multifaceted. I get to work on projects that I am passionate about and interested in. Every day is exciting to me and not a chore, since I get up every day to do what I most enjoy. I also have the privilege to meet the most interesting people in my work.

What are some of your biggest achievements till date?

I am most proud of being awarded the President's Technology Award on a research project that has spun out into a biotech company which has expanded its activities into the US. I am now on my third start up!

What are some of the challenges that we need to work on, to facilitate more women to work in STEM?

Career progression and academic promotion can be interrupted due to family reasons, which does not affect male counterparts. All efforts should be explored to provide adequate support and facilities for mothers returning to work.

What message would you like to give to young girls and women who are interested in pursuing a career in STEM?

There is no better time than now to display your full potential in STEM. As a 21st Century woman, follow your ambitions as nothing is impossible. Onwards and upwards, and never look back!

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