BIOENGINEERING, BIOMEDICAL & MATERIALS FRONTIERS

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Dr. Naash is an expert on genetic mutations associated with hereditary retinal and hearing disorders. Her research is focused on understanding genetic mutations and devising therapies to treat these disorders. She has achieved both national and international recognition for her work involving viral and non-viral ocular delivery. She was voted as one of the "50 Woman Making a Difference in Oklahoma in 2005." In 2005, she was also nominated for the Woman of the Year award. She has published extensively on hereditary retinal disorders.

RETINAL AND HEARING DISORDERS

Figure (a)

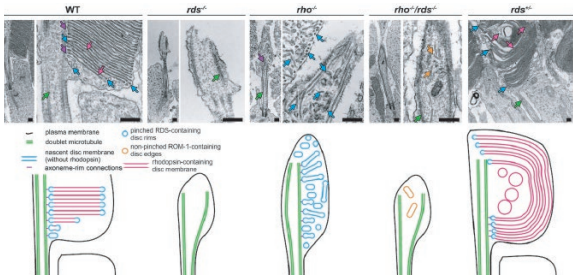

Figure (b)

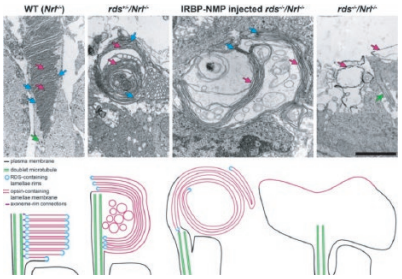

Figure (a): *Models with different rod outer segment ultrastructure (top) and diagrams (bottom).* ***Figure (b)*** *Models with different cone outer segment ultrastructure (top) and schematics of these models (bottom). Arrows in both are color coded to match features shown in schematics.*

The proteins present in the photoreceptor cells and/or cochlear cells play a significant role in the pathogenesis of hereditary retinal and hearing disorders. Hence, it is important to understand the function of these proteins in order to devise therapies to treat these disorders. Additionally, current non-viral genetic therapies for treatment of chronic diseases in the tissues that do not exhibit cell turnover (for instance, the retina and retinal pigment epithelium (RPE)) exhibit transient gene expression and have limited use.

Dr. Naash is characterizing the functional role of photoreceptor specific tetraspanin proteins and flavins and flavin binding proteins. She is studying the role of the usherin protein in the pathogenesis of hearing impairment and vision loss in Usher Syndrome patients.

To overcome the limitations of current therapies for retinal disorders, Dr. Naash has engineered several vectors to target the photoreceptor and the RPE. She has demonstrated that these vectors do not exhibit appreciable decrease in the tissue-specific and reporter gene expression over the life of the animal that had been treated with the above-mentioned vector. Importantly, Dr. Naash has developed a DNA nanoparticle delivery system that can deliver large genes that are over 15,000 base pairs in size efficiently to target locations. In addition to being safe and efficient, Dr. Naash's vector and nanoparticle delivery system will enable long term gene expression in patients suffering from herditary retinal disorders.

Publications

1. Conley, S.M., Stuck, M.W., Watson, J.N., Zulliger, R., Burnett, J.L., and Naash, M.I. Prph2 Initiates Outer Segment Morphogenesis but Maturation Requires Prph2/Rom1 Oligomerization. Human Molecular Genetics, 2019, 28 (3), 459-475.

2. Zulliger R., Conley, S.M., Mwoyosvi, M.L., Stuck, M.L., Azadi, S., and Naash, M.I. SNAREs Interact With Retinal Degeneration Slow and Rod Outer Segment Membrane Protein-1 During Conventional and Unconventional Outer Segment Targeting. PLoS ONE, 2015, 10(9), e0138508.

3. Kelley, R.A., Conley, S.M., Makkia, R., Watson, J.N., Han, Z., Cooper, M.J., and Naash, M.I. DNA Nanoparticles are Safe and Nontoxic in Non-Human Primate Eyes. Int J Nanomedicine, 2018, Mar 8, 13, 1361-1379.

4. Han, Z., Conley, S.M., Makkia, R.S., Cooper, M.J., and Naash, M.I. DNA Nanoparticle-Mediated ABCA4 Delivery Rescues Stargardt Dystrophy in Mice. J Clin Invest., 2012 Sep., 122(9), 3221-3226.

5. Sinha T., Makia, M., Du, J., Naash, M.I., and Al-Ubaidi, M.R. Flavin Homeostasis in the Mouse Retina During Aging and Degeneration. J Nutr Biochem. 2018 Dec, 62, 123-133.