Fall 2025

Biochemistry and Molecular Biology Brown Bag Series

Mike Kemp
Associate Professor

"Utilization of an error-prone DNA damage tolerance pathway in the skin of older adults following UV exposure"

Tuesday, September 16, 2025

11:00 AM

Location 135 Oelman Hall

Lab: Mike Kemp, Ph.D.

Boonshoft School of Medicine
WRIGHT STATE UNIVERSITY

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https://science-math.wright.edu/biochemistry-and-molecular-biology

Abstract

Non-melanoma skin cancers (NMSCs) are the most common types of cancer and are primarily caused by exposure to UV wavelengths of sunlight, which induces the formation of DNA photoproducts that are mutagenic if not properly removed by the nucleotide excision repair system. Most NMSCs occur in people over the age of 60, and thus age is a second risk factor for NMSC development. Though prior studies have shown that skin of older individuals is less efficient at removing UV photoproducts from DNA, how geriatric skin tolerates this unrepaired DNA damage had not previously been examined. Using skin biopsies obtained from young adults (under the age of 30) or older adults (over the age of 65), we observed higher levels of mono-ubiquitination of the replicative clamp protein PCNA in the epidermis of geriatric individuals than in younger individuals. This post-translational modification of PCNA serves as a signal to recruit specialized but more error-prone translesion synthesis (TLS) DNA polymerases to sites of DNA damage. In our recent work using additional biopsies from young and older adults, we further found that the expression of several TLS polymerases is inversely correlated with expression of the skin aging gene COL1A1 among geriatric individuals and to be altered by UV exposure relative to young adult skin. Though several factors likely impact DNA damage responses in the skin of older individuals, we and others have shown DNA repair, DNA damage checkpoint signaling, and activation of the TLS pathway to be correlated with reduced expression of insulin-like growth factor-1 (IGF-1) by dermal fibroblasts. Interestingly, dermal wounding methods such as fractionated laser resurfacing (FLR) can be used to restore IGF-1 expression in aged human skin, to improve the removal of UV photoproducts following UV exposure, and to reduce the incidence of pre-cancerous lesions and NMSCs. Thus, DNA damage responses to UV radiation can be improved in cancer-prone older individuals by dermal wounding to reduce NMSC risk.