Excerpt Science Daily

Intense light activates proteins shown to protect against lung damage in mice, a discovery that could have major therapeutic implications for treating diseases like acute lung injury in humans, according to a new study from researchers at the University of Colorado Anschutz Medical Campus.

"Acute lung injury has a mortality rate of 40%," said the study's lead author Tobias Eckle, M.D., professor of anesthesiology at the University of Colorado School of Medicine. "No specific therapy exists, and novel treatment options are needed."

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Intense light elicited alveolar type 2 specific circadian PER2 protects from bacterial lung injury via BPIFB1

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Abstract

Circadian amplitude enhancement has the potential to be organ protective but has not been studied in acute lung injury (ALI). Consistent light and dark cycles are crucial for the amplitude regulation of the circadian rhythm protein Period 2 (PER2). Housing mice under intense instead of ambient light for one week (Light: Dark cycle:14h:10h), we demonstrated a robust increase of pulmonary PER2 trough and peak levels, which is consistent with circadian amplitude enhancement. A search for the affected lung cell type suggested alveolar type 2 (ATII) cells as strong candidates for light induction of PER2. A head-to-head comparison of mice with cell-type specific deletion of Per2 in ATII, endothelial, or myeloid cells uncovered a dramatic phenotype in mice with an ATII-specific deletion of Per2. During Pseudomonas aeruginosa induced ALI, mice with Per2 deletion in ATII cells showed 0% survival while 85% of control mice survived. Subsequent studies demonstrated that intense light therapy dampened lung inflammation or improved the alveolar barrier function during Pseudomonas aeruginosa induced ALI, which was abolished in mice with an ATII-specific deletion of Per2. A genome-wide mRNA array uncovered Bactericidal/Permeability-Increasing Fold-Containing Family B Member 1 (BPIFB1) as a downstream target of intense light elicited ATII-PER2 mediated lung protection. Using the flavonoid and PER2 amplitude enhancer nobiletin we recapitulated the lung-protective and anti-inflammatory effects of light and BPIFB1, respectively. Together, our studies demonstrate that light elicited amplitude enhancement of ATII specific PER2 is a critical control point of inflammatory pathways during bacterial ALI.