WVU Neuroscience Chair, Dr. Randy Nelson, Reveals Hidden Dangers of Artificial Light at Night in Groundbreaking Research

New article details how dim light exposure triggers inflammation, metabolic issues, and mood disorders—with clinical trials testing interventions.

Dr. Randy J Nelson, Professor and Chair, Hazel Ruby McQuain Chair for Neurological Research, Department of Neuroscience, Rockefeller Neuroscience Institute, West Virginia University

MORGANTOWN, WV, UNITED STATES, July 8, 2025 /EINPresswire.com/ -- Even dim artificial light at night—from digital clocks, streetlights, and electronic devices—can trigger a cascade of negative health effects including immune dysfunction, metabolic disruption, and mood disorders, according to pioneering research by Dr. Randy J. Nelson featured in a comprehensive new Genomic Press Innovators & Ideas interview published today in Brain Medicine.

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>
> *Dr. Nandy Nelson*

Dr. Nelson, Chair of the Department of Neuroscience at West Virginia University (WVU) and one of the world's foremost authorities on circadian biology, has spent more than 15 years documenting how modern lighting environments fundamentally alter human physiology. His research, spanning over 500 peer-reviewed publications and 12 books, demonstrates that artificial light exposure doesn't merely affect sleep—it reprograms core biological systems that evolved over millions of years to function in natural light-dark cycles.

"Nocturnal exposure to artificial light represents a persistent physiological stressor that disrupts immune regulation, promotes inflammatory

processes, dysregulates metabolic function, and alters mood-related neurotransmitter systems, potentially contributing to depressive and anxiety disorders," Dr. Nelson explained in the interview.

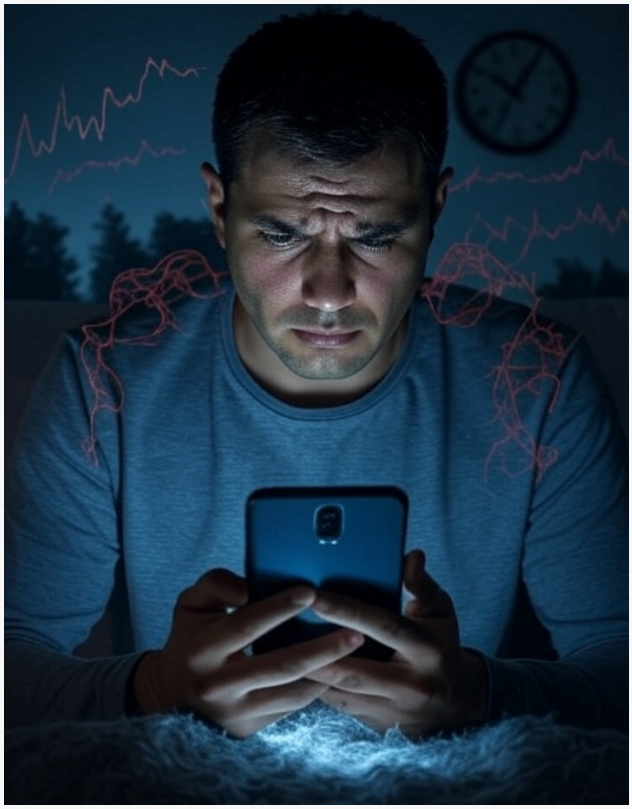

Illustration of artificial light at night causing bodily stress, reflecting Dr. Randy Nelson's research on disrupted circadian rhythms and their impact on neuroinflammation, metabolism, and mood, as discussed in Dr. Nelson's Genomic Press Interview.

Clinical Trials Bring Laboratory Discoveries to Patient Care

The interview reveals how Dr. Nelson's team is translating decades of foundational research into clinical applications through three ongoing trials at WVU Medicine. Two randomized controlled trials in intensive care units are testing whether filtering disruptive wavelengths of light or implementing circadian-friendly lighting protocols can improve recovery outcomes for stroke and cardiac surgery patients.

"ICU environments typically maintain bright, constant illumination that completely overrides natural circadian signals," Dr. Nelson noted. "Our preliminary data suggest that simple lighting modifications could significantly reduce neuroinflammation markers and shorten hospital stays."

A third clinical trial equips night shift ICU nurses with specially-timed bright blue light visors designed to strengthen alertness during shifts while preserving their ability to achieve restorative sleep during off-hours. This intervention addresses the critical health challenges faced by the 15-20% of the workforce engaged in shift work, a population the World Health Organization has identified as having elevated cancer risk due to circadian disruption.

From Farm to Laboratory: An Unconventional Scientific Journey

The interview traces Dr. Nelson's remarkable path to scientific prominence, beginning with night shifts at a turkey processing plant during high school in rural Ohio. After working as an autopsy assistant at Cleveland hospitals, conducting over 100 postmortem examinations, a chance encounter during a vacation to the San Diego Zoo redirected his life toward academia.

"I went to inquire about jobs at the zoo and learned the only opening was for someone to help conduct autopsies on animals," Dr. Nelson recalled. This led to his enrollment at University of California (UC) San Diego and eventually to UC Berkeley, where he became the first person in the United States to simultaneously earn two doctoral degrees, in Psychology and Endocrinology.

This interdisciplinary foundation proved crucial for his later work connecting behavioral observations with underlying physiological mechanisms. After faculty positions at Johns Hopkins University and The Ohio State University, Dr. Nelson was recruited to WVU in 2018 to establish the new Department of Neuroscience.

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Randy J. Nelson: Disruption of circadian rhythms on brain function and health

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Randy Nelson studies sleep and circadian rhythms in health and illness. For the past 15 years, his lab has focused on the role of disrupted circadian rhythms on physiology and behavior. He studies the effects of these disrupted circadian rhythms on several parameters including immune function, neuroinflammation, metabolism, sleep, and mood. He has published nearly 500 papers and more than 12 books during his career describing studies in biological rhythms, behavioral neuroendocrinology, stress, immune function, and aggressive behavior. He has been elected to Fellow status in several scientific societies. Nelson earned his AB and MA degrees in Psychology at the University of California, Berkeley. He earned a PhD in Psychology, as well as a second PhD in Endocrinology, both from UC Berkeley; he was the first in the US to simultaneously earn two PhDs. Dr. Nelson then completed a postdoctoral fellowship at the University of Texas, Austin, after which he joined the faculty at The Johns Hopkins University, where he became professor of Psychology, Neuroscience, Biochemistry, and Molecular Biology. He then served on the faculty at The Ohio State University from 2000–2018, during which time he served as Distinguished University Professor and Chair of Neuroscience, as well as the co-director of the Neurological Institute. Dr. Nelson was recruited to WVU in 2018 to serve as professor and inaugural chair for the new Department of Neuroscience. In addition to his NIH funding, he is Co-I of the NSF Track 1 award, 'West Virginia Network for Functional Neuroscience and Transcriptomics'. He has directly mentored 25 PhD and 16 postdoctoral colleagues. In this Genomic Press Interview Dr. Nelson shares insights into his personal and professional trajectories.

Figure 1. Randy J. Nelson, PhD, West Virginia University, USA.

Dr. Randy Nelson, Genomic Press Interview in Brain Medicine (Genomic Press, New York, ISSN 2997-2639 and 2997-2647)

Research Reveals Multiple Pathways of Harm

Dr. Nelson's laboratory has identified several mechanisms through which artificial light at night affects health:

Immune System Disruption: Light exposure during biological night can suppress normal immune responses while simultaneously triggering excessive inflammation. This dual effect may explain increased susceptibility to infections alongside elevated risk of inflammatory diseases in shift workers and others exposed to nighttime light.

Metabolic Dysfunction: The research demonstrates clear links between light at night and disrupted glucose-insulin dynamics, potentially accelerating development of obesity and type 2 diabetes. "Our metabolic systems expect periods of fasting aligned with darkness," Dr. Nelson explained. "Artificial light sends conflicting signals that can lead to insulin resistance and weight gain."

Neuroinflammation and Mood Disorders: Perhaps most concerning are findings showing that light at night increases inflammatory markers in brain regions critical for mood regulation. This may help explain the elevated rates of depression and anxiety in populations with high nighttime light exposure.

Wildlife and Ecological Impacts: The interview also touches on broader environmental consequences, noting that global artificial light at night has increased by approximately 9% annually over the past decade. This affects not just humans but entire ecosystems, disrupting migration patterns, reproduction cycles, and predator-prey relationships.

Time-of-Day: The Hidden Variable in Biomedical Research

One of Dr. Nelson's most significant contributions involves advocating for recognition of time-of-day as a critical biological variable in all research. He points out that experimental outcomes can vary by orders of magnitude depending on when measurements occur, yet this information is rarely reported in scientific publications.

"We have seen identical experiments produce opposite results simply based on whether they were conducted in the morning versus evening," Dr. Nelson stated. "This has profound implications for research reproducibility and may explain many conflicting findings in the literature."

His advocacy has influenced policy, with NIH grant guidelines now encouraging researchers to report and consider circadian timing in their studies. Dr. Nelson is working with colleagues to draft best practice guidelines that would make timestamp reporting a standard requirement for publication.

Building Scientific Communities and Public Understanding

As president of the Association of Medical School Neuroscience Department Chairs and co-investigator on West Virginia's NSF Track 1 award for Functional Neuroscience and Transcriptomics, Dr. Nelson emphasizes the importance of supporting early-career researchers and bringing science to underserved communities.

His outreach efforts include WVU's Brain Camp for rural high school students, the Feed Our Brains initiative that addresses school lunch debt while educating about nutrition and brain development, and community programs encouraging families to reduce evening screen time. He recently published "Dark Matters" with Oxford University Press, making circadian science accessible to general audiences.

Practical Recommendations for Healthier Light Exposure

The interview concludes with evidence-based recommendations for minimizing artificial light's negative effects:

1. Spectral considerations: Replace cool white LEDs (above 5000K) with warmer tones (2700-3000K) after sunset
2. Intensity management: Use dimmers or smart bulbs to reduce brightness in evening hours
3. Environmental controls: Install blackout curtains and remove light-emitting devices from bedrooms
4. Digital hygiene: Enable night modes on all devices and consider blue-blocking glasses for evening screen use
5. Consistency: Maintain regular sleep-wake schedules to anchor circadian timing

What’s Next for Nelson’s Lab?

Future projects will probe ALAN's impact on microglial pruning during adolescence, test smart lighting systems that adapt spectral output in real time, and explore chronotherapeutic drug delivery aligned with patients' individual circadian phases.

"We are at an inflection point where the science is clear enough to drive policy and design changes," Dr. Nelson concluded. "The question is whether we will act on this knowledge to create healthier light environments for current and future generations."

About Brain Medicine

Dr. Randy Nelson's Genomic Press interview is part of a larger series called Innovators & Ideas that highlights the people behind today's most influential scientific breakthroughs. Each interview in the series offers a blend of cutting-edge research and personal reflections, providing readers with a comprehensive view of the scientists shaping the future. By combining a focus on professional achievements with personal insights, this interview style invites a richer narrative that both engages and educates readers. This format provides an ideal starting point for profiles that explore the scientist's impact on the field, while also touching on broader human themes. More information on the research leaders and rising stars featured in our Innovators & Ideas – Genomic Press Interview series can be found in our publications website: https://genomicpress.kglmeridian.com/.

The Genomic Press Interview in Brain Medicine titled "Randy J. Nelson: Disruption of circadian rhythms on brain function and health," is freely available via Open Access on 8 July 2025 in Brain Medicine at the following hyperlink: https://doi.org/10.61373/bm025k.0083.

Brain Medicine (ISSN: 2997-2639, online and 2997-2647, print) is a peer-reviewed medical research journal published by Genomic Press, New York. Brain Medicine is a new home for the cross-disciplinary pathway from innovation in fundamental neuroscience to translational initiatives in brain medicine. The journal's scope includes the underlying science, causes, outcomes, treatments, and societal impact of brain disorders, across all clinical disciplines and their interface.

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