Melanopic EDI — Equivalent Daylight Illuminance (melanopic lux)

Spectrally weighted metric for ipRGC stimulus

Definition

Photometric metric weighted to melanopsin sensitivity; better predictor of circadian/non-visual effects than photopic lux alone.

Recommended Ranges

|  |  |
| --- | --- |
| Optimal | ≥250–500 melanopic lx for students during daytime (especially morning). |
| Caution | 100–249 mEDI (weak); <100 mEDI (insufficient). |

Biological Effects

Hormones (Endocrine)

Daytime ≥250 mEDI → robust melatonin suppression and entrainment; supports morning cortisol peak.

Daytime light improves serotonin availability (precursor to nocturnal melatonin).

Skin (Photobiology & Peripheral Clocks)

Skin opsins (e.g., OPN5) may align local circadian rhythms; systemic hormonal impact mostly retinally mediated.

Nervous System (ipRGC → SCN → CNS)

Strong melanopic drive synchronizes SCN, improving arousal networks (noradrenergic/cholinergic).

Biochemical Pathways (Mechanistic Detail)

OPN4 (Gq/11) → PLCβ → IP3/DAG → Ca²⁺ rise → transcriptional effects in SCN neurons.

SCN coordinates peripheral oscillators via neuropeptides (VIP, AVP) stabilizing metabolism and cognition.

Classroom Recommendations

Use spectrally tuned luminaires/daylight to reach morning mEDI targets.

Verify with spectrometer or CIE S 026 calculator.

Quick Checklist

mEDI measured at eye height for seated students.

Morning exposure window ≥2 h at target levels.

References

Brown TM et al. (2022) — Reporting light for non-visual effects (melanopic metrics).

CIE S 026/E:2018 — System for metrology of optical radiation for ipRGC-influenced responses.

WELL — Circadian lighting feature guidance.