

## REVIEW ARTICLE

# PERSONALIZED CHRONOTHERAPY: BRIDGING PRECISION MEDICINE WITH CIRCADIAN THERAPEUTICS

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### ABSTRACT

The integration of precision medicine with chronotherapy offers a cutting-edge approach to optimizing treatments by aligning them with both individual biological variability and circadian rhythms. Circadian rhythms, controlled by the suprachiasmatic nucleus (SCN), regulate key physiological processes such as metabolism, hormone release and immune function. Disruptions to these rhythms, often caused by lifestyle factors, are linked to diseases like cancer, cardiovascular disorders and metabolic conditions. Precision medicine tailors treatments based on a patient's genetic, environmental and lifestyle factors, while chronotherapy ensures drugs are administered at the most effective times. Advanced drug delivery systems, including smart and pulsatile technologies, wearables that monitor the personalized body functioning as well as genetic analysis allow precise drug release, maximizing effectiveness and reducing side effects with personalized dosage regimen. Regulatory hurdles and clinical validation are key to a broader adoption of these technologies.