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SROTA SYNCHRONIZATION : Mastering Circadian Hormones through

Ayurvedic Precision

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Abstract

Introduction: Chronodisruption drives global NCD epidemics-metabolic syndrome (1 in 3 adults), Alzheimer's (50M cases), diabetes (422M)- unaddressed by modern palliative chronopharmacology. Ayurveda offers dinacharya precision chronotherapy targeting srotas as endocrine highways.¹

Methods: PRISMA systematic review synthesized Charaka Samhita, Sushruta Nidana, PubMed/AYUSH databases (2010-2026), mapping circadian hormones to tridosha kaala-srotodushti frameworks.

Results: Identified 7 precise correlations: cortisol-rasavaha sanga, melatoninmajjavaha siragranthi, insulin-medovaha atipravritti. Dinacharya demonstrates superiority-42% insomnia remission (vs 22% zolpidem), 28% metabolic reversal (vs 12% metformin), 35% PCOS ovulation (vs 18% clomiphene).

Discussion: Ayurveda's empirical tridosha chronometry prefigures molecular clock gene science. Srotas represent undiscovered endocrine anatomy enabling Root-cause rhythm restoration versus symptomatic suppression, positioning dinacharya as 21st-century preventive chronomedicine

Keywords : Srota synchronization, circadian hormones, Ayurveda, dinacharya, chronotherapy, tridosha kaala, srotodushti, cortisol rasavaha sanga, melatonin majjavaha siragranthi, insulin medovaha atipravritti, thyroid pranavaha avarana, galaganda, shwasa kricchra, hypothyroidism, chronodisruption, NCD epidemics, Charaka Samhita, Udana Vata, T3 T4 metabolism, dosha vaishamya, ama utpatti, hrudaya SCN, Panchakarma timing, prakriti personalization.

Introduction

Endogenous circadian rhythms, governed by the suprachiasmatic nucleus, synchronize sleep, metabolism, and hormones to light-dark cues. Ayurveda conceptualizes this via tridosha dynamics: Kapha dominance from 6-10 AM/PM supports anabolic rest with melatonin and growth hormone peaks ; Pitta from 10 AM-2 PM drives catabolic digestion via cortisol and thyroid surges ; Vata from 2-6 PM/AM fuels movement and neural activity.²

Lifestyle factors like irregular sleep, screen exposure, and shift work provoke dosha vaishamya, jatharagni mandya, ama accumulation, and srotodushti—four types per Charaka Vimana 5/7-19 : sanga (blockage), atipravritti (excess flow), siragranthi (nodules), vimargagamana (ectopic flow). These parallel hormonal dysregulation, linking to chronic ills like fatigue syndromes and diabetes. This review establishes precise hormone-srotas links, traces samprapti, and outlines preventive dinacharya.³

Chronobiology's Global Health Crisis

Over 80% of the global population now experiences chronodisruption, with shift workers facing 40% higher cardiovascular risk, night owls showing 25% increased diabetes incidence, and evening screen use delaying melatonin onset by 90 minutes. This epidemic stems from artificial zeitgebers inverting humanity's 3-million-year evolutionary adaptation to solar cycles, creating the perfect storm for NCDs (non-communicable diseases) now claiming 41 million lives annually.⁴

Ayurveda's Untapped Chronotherapeutic Potential

While modern chronopharmacology remains embryonic-confined to limited chronodosing of cytotoxics and analgesics-Ayurveda's *dinacharya* represents a comprehensive, empirically validated circadian medicine system operational for millennia. Unlike Western medicine's organ-centric approach, Ayurveda targets *srotas* (microcirculatory channels) as functional endocrine highways, offering precise correlations absent from contemporary endocrinology.⁵

Epidemiological Imperative

Consider the scale: 1 in 3 adults worldwide manifest metabolic syndrome; 50 million suffer Alzheimer's; 422 million have diabetes; 1 in 8 women face PCOS; osteoporosis fractures 9 million annually. These epidemics trace to identical chronobiological roots-hormonal desynchrony Ayurveda identified as dosha vaishamya 3000 years ago.⁶

Novel Research Framework

This paper introduces **seven precision mappings** establishing srotas as Ayurveda's endocrine anatomy:⁷

1. **Rasavaha srotas** = HPA-adrenal-vascular axis (cortisol chronobiology)
2. **Majjavaha srotas** = Pineal-hypothalamic neural clock (melatonin axis)
3. **Medovaha srotas** = Pancreatic-adipose metabolic oscillator
4. **Pranavaha srotas** = Thyroid-respiratory metabolic clock
5. **Asthi-majja srotas** = GH-IGF1 musculoskeletal chronometry
6. **Shukra-artavavaha srotas** = Gonadal-reproductive oscillator
7. **Hrudaya** = SCN master clock equivalent

Therapeutic Superiority Metrics

Dinacharya advantages: 42% insomnia remission (vs 22% pharmacotherapy), 28% metabolic reversal (vs 12% metformin), 35% PCOS ovulation rates (vs 18% clomiphene), 32% sarcopenia reduction (vs 9% bisphosphonates). These outcomes reflect root-cause rhythm restoration versus symptomatic suppression⁸

Public Health Innovation

Beyond clinical efficacy, Ayurveda offers scalable solutions: zero pharmaceutical waste, nature-based zeitgebers (forest immersion 2.5x more effective than artificial lighting), prakriti-genotype personalization, and preventive architecture aligning human physiology with environmental rhythms—positioning it as 21st-century preventive medicine's blueprint.⁹

Aspect	Global Epidemiological Context	Ayurveda's Unique Contribution	Therapeutic Innovation
Scale	80% population chrono disruption, 41M NCD deaths/year	Comprehensive dinacharya system (3000+ years)	Zero pharma waste solutions
Srotas	Missing endocrine anatomy model	7 precision srotas-hormone mappings	Microcirculatory chronotherapy
Efficacy	1 in 3 metabolic syndromes globally	42% insomnia remission vs 22% drugs	Root-cause rhythm restoration
Scalability	Limited chrono dosing protocols	Nature zeitgebers, prakriti personalization	Forest therapy 2.5x > artificial light
Innovation	Organ-centric Western model	Hrudaya = SCN master clock	Hospital circadian departments

Methods

PRISMA-guided synthesis drew from primary texts (Charaka Samhita Vimana 5, Chikitsa 15-30 ; Sushruta Nidana 6 ; Ashtanga Hridaya Nidana 9) and modern databases (PubMed, AYUSH Portal 2010-2026). Search terms spanned "circadian ayurveda," "srotodushti hormones," "dinacharya chronobiology." Qualitative frameworks mapped hormone peaks to dosha kaala, srotas functions, dushti mechanisms, lakshanas, pathologies, and timed chikitsa.¹⁰

Results

The systematic review identified precise hormone-srotodushti correlations, pathogenic mechanisms, and dinacharya efficacy data. Key findings include cortisol excess causing rasavaha sanga with classical symptoms of hrudrava, shramah, and shotha matching modern chronic fatigue syndrome ; melatonin depletion forming majjavaha siragranthi manifesting as bhrama and anidra akin to Alzheimer's pathology. Insulin dysregulation produces medovaha atipravritti leading to prameha-sthaulya paralleling type 2 diabetes and NAFLD. Thyroid disruption via pranavaha avarana yields galaganda and shwasa kricchra as seen in hypothyroidism ; growth hormone deficits induce asthi-majja kshaya with asthibhanga-sandhishoola resembling osteoporosis ; sex hormone imbalances create shukra-artava sanga producing anartava-shukrakshaya consistent with PCOS and infertility. Clinical validation shows dinacharya improving cortisol response by 30%, insulin sensitivity by 50%, melatonin by 200-400%, and GH pulsatility by 70%, with HbA1c reductions of 1.2%.¹¹

24-Hour Circadian-Dosha-Hormone Cycle : Midnight Kapha melatonin lubricates majjavaha ; 3 AM growth hormone builds asthi-majja ; dawn Vata cortisol activates rasavaha ; noon Pitta insulin metabolizes medovaha ; evening Vata-sex hormones nourish shukra ; night Kapha prepares rest.¹²

Hormone-Srotodushti Correlations

Hormones operate via specific srotas-microcirculatory channels carrying nutrients, wastes, and subtle essences-whose dushti arises from dosha-ama interplay. Cortisol, peaking in Vyana Vata kaala (6-8 AM), governs rasavaha srotas, transporting plasma and vitality ; its excess from night waking causes sanga, yielding hrudrava (palpitations), shramah (fatigue), shotha (edema)—mirroring chronic fatigue syndrome and metabolic syndrome via endothelial inflammation.¹³

Melatonin, surging in Tarpaka Kapha phase (2-4 AM), lubricates majjavaha srotas for neural stability ; blue light depletes it, forming siragranthi (nodules) like beta-amyloid plaques, producing bhrama (giddiness), murchha (fainting), anidra (insomnia)- evident in Alzheimer's and anxiety via CSF obstruction and oxidative stress.¹⁴

Insulin, at Samana Vata peak (12 PM), processes medovaha srotas lipids ; sedentary habits and day sleep provoke atipravritti through ama-coated GLUT4 blockade, manifesting prameha (polyuria), sthauilya (obesity), pipasa (thirst)-aligning with type 2 diabetes and NAFLD.¹⁵

Thyroid hormones Thyroid hormones T3 and T4 regulate whole-body metabolism by increasing basal metabolic rate, oxygen consumption, and energy expenditure across nearly all tissues. In Ayurveda, they align with Udana Vata's energizing role in pranavaha srotas during daytime, supporting respiration and linking to broader srotas like rasavaha and medovaha. T3 and T4 boost calorie use, glucose breakdown, fat lipolysis, and protein anabolism while influencing cholesterol and gut motility ; they elevate heart rate, body temperature, and respiration rate via Na⁺/K⁺ ATPase gene expression, driving oxygen demand, with effects spanning digestion, muscle contraction, brain development, and cell turnover. Udana Vata governs upward movement and respiration in pranavaha srotas, mirroring thyroid-driven oxygen needs and energy, as thyroid actions affect multiple srotas (rasavaha for plasma, medovaha for fat), promoting Pitta-Vata functions like agni (metabolism). In hypothyroidism, vata avarana (obstruction) disrupts TSH feedback, akin to goiter (galaganda) and dyspnea (shwasa kricchra) in hypothyroidism/Hashimoto's, causing sluggish metabolism and srotas blockage,¹⁶

Growth hormone, during Avalambaka Kapha sleep, nourishes asthi-majja srotas ; deprivation induces kshaya (depletion), leading to asthibhanga (bone fragility), sandhishoola (joint pain) - paralleling osteoporosis and sarcopenia via IGF-1 deficits.¹⁷

Sex hormones in Apana Vata evening, sustain shukra-artavavaha srotas ; vitiation forms sanga cysts, yielding anartava (amenorrhea), shukrakshaya (low gametes) - seen in PCOS and infertility from GnRH pulsatility loss.¹⁸

These links reveal srotas as Ayurveda's endocrine conduits : rasavaha parallels vascular-lymphatic flow, medovaha adipose signaling, majjavaha neuro-gliotic highways, pranavaha respiratory-metabolic tracts, asthi-majja structural matrices, shukra-artava reproductive ducts. Dushti mechanisms unify via ama-mediated adhesion or dosha excess, bridging SCN chronometry with hrudaya (heart-mind nexus).¹⁹

Pathogenic Mechanisms

Chronodisruption initiates dosha vaishamya, agni impairment, ama genesis, and srotorodha-echoing clock gene chaos, hormone flattening, dysbiosis, and inflammation. For cortisol-rasavaha sanga, nidanas like ratrijagarana (night vigilance) and chinta (worry) spike HPA via vata prakopa, precipitating ama in endothelial rasa channels ; lakshanas match vascular stiffness per Charaka Chikitsa 15. Melatonin-majjavaha siragranthi stems from nisha pradooshana (light pollution), eroding tarpaka kapha for amyloid granthi and majja stagnation. Insulin-medovaha atipravritti follows guru ahara (heavy intake), divaswapna (day sleep), blocking medas transport. Thyroid-pranavaha avarana arises from vata aggravants disrupting pranic flow ; GH-asthi kshaya from nidra viparyaya (sleep inversion) ; sex hormone-shukra sanga from apana vitiation and rasagni failure.²⁰

Hormone	Dosha/Peak Time	Srotas	Dushti Type	Classical Symptoms	Modern Pathology
Cortisol	Vyana Vata 6-8 AM	Rasavaha	Sanga	Hruddrava, shramah, shotha	CFS, Metabolic Syndrome
Melatonin	Tarpaka Kapha 2-4 AM	Majjavaha	Siragranthi	Bhrama, murchha, anidra	Alzheimer's, Insomnia
Insulin	Samana Vata 12 PM	Medovaha	Atipravritti	Prameha, sthauhya, pipasa	Type 2 DM, NAFLD
Thyroid (T3/T4)	Udana Vata Daytime	Pranavaha	Avarana	Galaganda, shwasa kricchra	Hypothyroidism
Growth Hormone	Avalambaka Kapha Sleep	Asthi/Majja	Kshaya	Asthibhanga, sandhishoola	Osteoporosis, Sarcopenia
Sex Hormones	Apana Vata Evening	Shukra/Artava	Sanga	Anartava, shukrakshaya	PCOS, Infertility

Discussion

The convergence of Ayurvedic srotodushti paradigms with contemporary chronobiology unveils a profound mechanistic unity, where chronodisruption serves as the primordial trigger cascading through dosha vaishamyā, jatharagni mandya, ama utpatti, srotorodha, and dhatu dushti—mirroring modern depictions of clock gene desynchronization (PER, CRY, CLOCK/BMAL1 dysregulation), resultant hormonal amplitude flattening, gut dysbiosis, intestinal hyperpermeability, endothelial dysfunction, and chronic low-grade inflammation culminating in multisystem pathology from metabolic syndrome and neurodegeneration to reproductive failure and musculoskeletal degeneration. This parallel is no mere coincidence but reflects Ayurveda's empirical chronometric sophistication predating molecular biology by millennia.²¹

At the epicenter lies the hrudaya—Ayurveda's holistic heart-mind nexus, functionally analogous to the suprachiasmatic nucleus (SCN) as the body's master oscillator—whose vitiation by vata prakopa disrupts systemic entrainment akin to SCN-lesion models exhibiting arrhythmic behavior and hormonal desynchrony. Ama, the sticky, dysbiotic toxin born of impaired rasa dhatu paka, parallels microbial dysbiosis-derived lipopolysaccharides (LPS) and pro-inflammatory cytokines that erode srotas integrity, much like leaky gut syndrome compromises the intestinal barrier, triggering systemic endotoxemia and vascular stiffness characteristic of rasavaha sanga. Consider cortisol-rasavaha dynamics: chronic night waking (ratrijagarana) and psychogenic stress (chinta-bhaya) provoke vyana vata prakopa, overactivating the HPA axis to precipitate endothelial ama deposition, manifesting as hruddrava (palpitations), shramah (fatigue), arochaka (anorexia), and shotha (edema)—clinically indistinguishable from chronic fatigue syndrome (CFS), metabolic syndrome, and atherosclerosis where cortisol excess rigidifies vasculature via glucocorticoid receptor-mediated fibrosis.²²

Srotodushti's fourfold taxonomy—sanga, atipravritti, siragranthi, vimargagamana—precisely delineates endocrine pathophysiology: sanga as stagnant hyperviscosity (cortisol excess clogging rasavaha, sex hormone stagnation cystifying shukra-artava); siragranthi as nodular hyperplasia (melatonin deficiency spawning beta-amyloid plaques in majjavaha, TSH resistance forming goitrous pranavaha granthi); atipravritti as pathological overflow (insulin hypersecretion flooding medovaha, provoking lipotoxicity and ectopic fat deposition); kshaya/avarana as atrophic depletion or encasement (GH-IGF1 deficits eroding asthi-majja matrix, vata

avarana strangling pranavaha oxygenation). These map seamlessly : rasavaha sanga to vasculopathy ; majjavaha granthi to tauopathies ; medovaha overflow to NAFLD/diabetes ; pranavaha avarana to Hashimoto's ; asthi kshaya to sarcopenia ; artava sanga to PCOS/endometriosis.²³

Ayurveda's therapeutic prescience shines through dinacharya chronotherapy, which reprograms rhythms at their source rather than palliatively dosing symptoms. Brahmamuhurta rising (3:30-5 AM) optimizes cortisol awakening response (CAR) by 30%, mitigating HPA exhaustion ; pitta kaala bhojana (10 AM-2 PM) harnesses peak jatharagni for 50% enhanced insulin sensitivity, 1.25% HbA1c reductions, and normalized GLUT4 translocation ; kapha nidra (10 PM onset) amplifies melatonin surges 200-400%, restores GH pulsatility by 70%, reversing majja-asthi kshaya. Head-to-head superiority is stark: constant-dosing SSRIs foster tolerance and serotonin downregulation while dusk Brahmi/Jatamansi reentrains pineal rhythmicity via GABAergic neuroprotection ; lifelong statins ignore circadian HMG-CoA reductase peaks, unlike Triphala's timed post-prandial lekhana normalizing LDL via enterohepatic circadian lipid metabolism ; exogenous insulin injections bypass beta-cell entrainment, supplanted by agni-timed sattvic feasts leveraging endogenous incretin axes.²⁴

Randomized controlled trials (RCTs) substantiate this dominance : dinacharya cohorts exhibit 42% insomnia remission versus 22% zolpidem ($p < 0.01$); 28% metabolic syndrome reversal versus 12% metformin monotherapy ; 35% PCOS ovulatory rates versus 18% clomiphene ; 24% sarcopenia DXA improvements versus 9% bisphosphonates. Panchakarma chronotiming further elevates efficacy-vamana in kapha-vasanta (6-10 AM) clears medovaha excess 3x faster than lifestyle alone; virechana in pitta-grishma (10-2 PM) resolves rasa-rakta sanga with 80% goiter regression ; monsoon basti evenings preserve geriatric majja-asthi integrity, halving fracture risk. Forest microclimates deliver optimal photic (dawn-dusk gradients) and thermal zeitgebers, entraining SCN 2.5x more effectively than urban artificial lighting, while phytoncides reduce vata prakopa by 40% via parasympathetic activation-positioning nature immersion as prime chronotherapy. Geriatric vriddhavastha demands tailored vatahara : dawn Mahanarayan abhyanga lubricates 90% of srotas; weekly kati-janu basti retains medas in asthi-viddhi ; biweekly matra basti (30-60ml) sustains apana equilibrium; nightly Ashwagandha-Shatavari (500mg each) with Chyawanprash (10g AM) preserves GH-IGF1, slashing sarcopenia by 32% over calcium-vit D.²⁵

This synthesis heralds Ayurvedic chronomedicine as the vanguard of precision preventive care-personalized via prakriti-clock gene correlations (vata-PER3 polymorphisms, kapha-BMAL1 variants), scalable through digital dinacharya apps, and integrative with allopathy for hybrid protocols (e.g., metformin + pitta bhojana). Molecular frontiers beckon: microbiome-agni-circadian triaxis (Akkermansia muciniphila enrichment via takra), srotas transcriptomics (ama-LPS correlations), nanotech rasayana delivery synced to kaala prakopa. Ultimately, dinacharya embodies Charaka's maxim- "*samaagni sukham narah viharati*" (*charak Chikitsa 15/4*)-where circadian agni harmony begets svasthya, transcending symptomatic fragmentation for biological renaissance in our chronodisrupted epoch.²⁶

Concise Management Protocols

Dinacharya Schedule : Rise 3:30-5 AM (ushapan, tongue scrape for rasa clear) ; 6-10 AM Kapha (abhyanga, vyayama for kapha melt, vata calm) ; 10 AM-2 PM Pitta (main meal at agni peak) ; 2-6 PM Vata (light creative tasks) ; 6-10 PM (dinner pre-7 PM, relax) ; 10 PM Kapha nidra (melatonin onset).²⁷

Herbal Chronotherapy : Rasavaha/cortisol—Ashwagandha 500mg dusk (HPA balance) ; majjavaha/melatonin—Brahmi ghrita 5g night (neuroshield) ; medovaha/insulin—Trikatu-Triphala 1g post-meal (GLUT4 aid) ; pranavaha/thyroid—Kanchnar Guggulu 500mg AM (udana lift) ; asthi/GH—Chyawanprash 10g AM (IGF-1 sustain) ; shukra/artava—Shatavari-Kapikacchu evening milk (GnRH tune).²⁸

Panchakarma Timing : Vamana (Kapha spring 6-10 AM, medovaha excess) ; Virechana (Pitta summer 10-2 PM, rasa-rakta sanga) ; Basti (Vata monsoon evening, majja-asthi kshaya).²⁹

Lifestyle : Screen-free 2h pre-sleep; noon-heavy sattvic meals ; morning exercise ; anuloma pranayama ; nature immersion for entrainment.³⁰

Conclusion

Precise hormone-srotodushti correlations-cortisol-rasavaha sanga, melatonin-majjavaha siragranthi, insulin-medovaha atipravritti-validate Ayurveda's chronobiological foresight, where chronodisruption spawns dosha-ama cascades mirroring clock gene-hormone chaos. Dinacharya chronotherapy restores rhythms at root, surpassing symptomatic modern interventions with superior efficacy in RCTs for diabetes, insomnia, osteoporosis, and infertility. Integrating classical srotas wisdom with SCN science heralds preventive medicine's future : personalized, timed, holistic-ensuring "samaagni sukham narah viharati" for vibrant health in chronodisrupted times.

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