

Chronotherapeutics: A Novel Approach in the Pharmacotherapy of Various Diseases

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Introduction

Most of the physiological functions of human body vary daily and this variation leads to changes in diseased state and in plasma drug concentration also. Due to the peak level of hormones in the body leads to disturbed sleep and increased pain. Human sleep activity cycle or solar/lunar adaptations depends on circadian rhythm and influenced by individual's genetic makeup is responsible to affect the physiological functions [1].

The human circadian rhythm is also responsible for variation of physiological functions in certain diseased states such as depression, rheumatoid arthritis, myocardial infarction, peptic ulcer etc. Many body functions such as metabolism, sleep pattern, hormone production and physiology are regulated by changed environmental factors due to biological rhythms.

These physiological variations are predictable resonating dynamic systems, which require varied amount of drug at predictably different times within the circadian cycle in order to achieve maximum desired and minimum undesired therapeutic drug effect. To meet the therapeutics need of the treatment based on pathological diseases, chronotherapeutic drug delivery systems is the best alternative way to deliver the drug.

Some of the hormones such as estrogen and progesterone are released by the brain during the morning time, while melatonin and cortisol are released during sleep. The physiological abnormalities such as blood pressure and heart rate are highest during the morning hours [2] and hence, most diseased symptoms occur during this period.

Chronotherapeutic Drug Delivery Systems

Chronopharmaceutics is a vital division of pharmaceutical technology meant for designing, fabrication and evaluation of drug delivery systems that release a bioactive therapeutic agent at a rhythm that ideally matches in real time the biological requirement for a given disease therapy.

Chronotherapeutic drug delivery system works on the basic concepts of human chronobiology. Tailoring of dosing schedule of such drug delivery systems based on chronobiological pattern helps to optimize the drug therapy. The coordination of peak plasma concentration of the drug with biological rhythm is the key design of such dosage forms to achieve safety and efficacy of the therapeutic agents used.

When the risk and/or intensity of the symptoms of the diseases such as asthma, arthritis, congestive heart failure, myocardial infarction, stroke, cancer, peptic ulcer etc., vary predictably over a time, then chronotherapy becomes most relevant to fulfil the needs of successful treatment.

Hence, novel drug delivery chronotherapeutic systems have been designed to treat the diseases in which biological rhythms play vital role in the pathophysiology of such diseases to avoid the degradation of bioactive agents such as proteins and peptides in gastric environment, for programmed delivery of few hormones which are susceptible to disturbed in normal feedback mechanism of human body and possibility of drug resistance when delivered by continuous release dosage forms, for the delivery of therapeutics which develop biological tolerance and susceptible for first pass metabolism and are targeted to specific sites of gastrointestinal tracts such as colon [3].

Conclusion

Research and advancements taken place in chronobiology and chronopharmacology has demonstrated the significance of circadian rhythms in the therapy of certain diseases and development of a novel chronotherapeutic drug delivery approach.

The limitations associated with of various drug delivery approaches put impact on success of treatment, and the chronotherapeutic drug delivery system gaining attention of pharmaceutical scientists to overcome such limitations. In future, it is hoped that, chronotherapy may improve patient outcome and optimize disease management.

Different chronotherapeutic drug delivery systems such as time-controlled, triggered, pulsed and programmed drug delivery systems have been applied in recent years. Since time and dosing schedule of drug delivery in various disease therapies has major blow upon success of the treatment, chronotherapy give room for further research in this direction.

References

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