CRIMEA STATE MEDICAL UNIVERSITY NAMED AFTER S I GEORGVSKY

MEDICAL BIOLOGY

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BIOLOGICAL RYTHEM AND THEIR MEDICINAL USE

Biological rhythms-Introduction

- Biological rhythms are an integral part of every day life for most organisms on earth.
- They regulate most important functions in each organism.
- In plant circadian clocks control flowering, response to seasons and photosynthesis.
- In mammals, circadian clocks manage sleeping, waking, feeding and controlling whether an animal is nocturnal or diurnal.

Behavior rhythms-definition

- A rhythm has been defined as a sequence of events that repeat themselves through time in the same order and the same interval.
- Simply a rhythm is a periodically recurring event.
- Many behavioral patterns of organisms are subject to rhythmic variations in response to various external geophysical rhythms in the environment.

Biological rhythms- definition

- Biological rhythms are those rhythms that arisen in organisms to match external geophysical rhythms with comparable period(Chandra sekaran 1986).
- A biorhythm means a periodic occurrence of specific physiological changes in living organisms.
- The majority of organisms show daily a d ar

Diurnal= day active

Nocturnal=night active

Crepuscular=twilight active

Parameters of biological rhythms

- Each biological rhythm is composed of repeating units called cycles.
- The length of time required to complete an entire cycle is the period.
- The magnitude of the change in activity rate during a cycle-the difference between peaks and toughs is the amplitude.
- Any specified recognizable part of a cycle is called a phase.

Properties of biological rhythms

- Biorhythms have self – sustaining pacemaker mechanism.
- Biorhythms maintain their normal cyclicity even in the absence environmental cues
- Biorhythms are unaffected by metabolic poisons or inhibitors.
- Biorhythms are genetically transmitted.

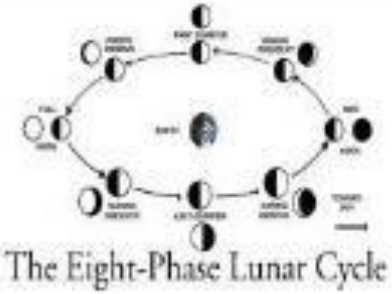
General criteria of biological rhythms

- The rhythms repeat in a given time period for e.g. circadian rhythms in every 24 hours.
- The rhythms persist in the absence of external cues.
- The rhythms can be adjusted to match the local time (entrain able).
- The rhythms maintain circadian periodicity over a range of physiological temperatures.

Endogenous biorhythms

1.Circadian - daily

Circa tidal – sea tide



Circulunar – moon phase

Circannual - annual

Classification of biorhythms -1

Physical classification- (period of oscillation)	• Circadian-24h • Ultradian-less than 20h • Infradian- more than 28h
Functional classification (periodic physiological factors)	• Alpha rhythm • Beta rhythm • Gamma rhythm
Mathematical Classification (numerical frequencies)	• Qualitative • Punctual • Discrete • episodic

Classification of biorhythms -2

Descriptive classification

- Diurnal, Nocturnal, Serotine, Vesperal
- Morning, Daily,
- Weakly, Monthly, yearly

Physiological Classification

- Essential rhythm
- Non-essential rhythm

Duration classification

- Permanent rhythm
- Temporary rhythm

Classification of biorhythms -3

Biological classification	• Conservative rhythms • Reproductive rhythms
Resistance classification	• Resistant rhythm • Labile rhythm
Ontogenetic classification	• Immature rhythms • Mature rhythms

Classification of biorhythms -4

Consistency classification	• Real rhythms • Virtual rhythms
Hierarchical classification	• Independent rhythms • Dependent rhythms

Classification of biorhythms -6

Biological rhythms

- Shot term rhythms
  - Circadian rhythms- Feeding ,activity, hunger and sleeping rhythms
- Long term rhythms
  - Lunar, semi-lunar, tidal, circannual, life cycle, breeding, migration rhythms

Types and examples of biorhythms

Epicycles

- *Arenicola marina*-lug worm-living in sand flats of intertidal zones.
- Feed every 6 to 8 min

Epicycles

- *Microtus* species, small mammal show bursts of activity by periods vary from 12 to 20 min.

Types and examples of biorhythms-2

Circa tidal rhythms

- *Mytilus edulis*- marine mussels opening the shell valves corresponding to the tides

Circa tidal rhythms

- *Uca pugnax* , fiddler crabs active during low tides

Circa tidal rhythms

- *Carcinus maenas* –shore crabs show daily activity based on tidal rhythms

Human rhythms

- Human body appears to be a clock – shop.
- There are several rhythms – one clock basis.
- Most of the rhythms are interdependent and coupled.
- There may be one master clock orchestrating all individual biological clocks.

Human being biorhythms

- Human biorhythms start from the moment a person is born.
- Most biorhythms are circadian.
- Certain biorhythms are the natural monthly fluctuations that govern physical, emotional and intellectual aspects of human beings.
- Human beings have three biorhythms:
  - Physical biorhythm -23 days.
  - Emotional biorhythm – 28 days
  - Intellectual biorhythm – 33days

Hormonal (endocrine) circadian rhythms

1. Growth hormone –increase during sleep; decrease during wakeful state.
2. Cortisol-highest during morning; lowest during sleep.
3. Prolactin –resembles like growth hormone cycle.
4. Aldosterone – peaks in afternoon; declines in evening.
5. Testosterone – low in afternoon; high in night.

Human circadian rhythms

- Activity/rest cycle
- Alertness cycle
- Brain activity cycle
- Blood pressure
- Cardiovascular performance
- Catecholamine levels
- Cortisol levels
- Endocrine levels
- Testosterone levels
- Thyroxine levels
- Insulin levels
- Endotoxin susceptibility
- Ethanol metabolism
- Prolactin levels
- Pituitary activity
- EEG
- Gastrointestinal rhythms
- Gonadal hormones
- Heart rate
- Pulse rate
- Melatonin levels
- Pineal activity

The circadian pace maker or master clock

- The master clock controls circadian rhythms.
- It consists of a group of brain cells in the hypothalamus called supra chiasmatic nucleus (SCN).
- The hypothalamus continually measures the light exposures via the retinal hypothalamic tract and accordingly adjusts the timing of the sleep-wake cycle.

Exogenous rhythm theory

- According to this theory, intracellular rhythm occurs in response to cyclic geophysical changes.
- Brown (1970) conceptualized the system has a two-layered ring.
- There is a core of unchanging geophysical cycles existing under a changeable system of factors like light, temperature and food.

Chronotherapy

- **Chronotherapy** refers to the use of circadian or other rhythmic cycles in the application of therapy.
- the treatment of an illness or disorder by administering a drug at a time of day believed to be in harmony with the body's natural rhythms.
- Chronotherapy is used in the treatment of sleep disorders, asthma, cancer, hypertension, and multiple types of depression, seasonal affective

Summary

- All behavior patterns are co-ordinated sequences of neuromuscular activity. A rhythm is a periodically recurring event.
- chronobiology is the study of science of life in relation with time.
- The majority of organisms show daily and annual cycles of activity and development

THANKYOU SO MUCH