National symposium on chronobiology*

The implications of biological rhythm research are immense in clinics and in the management of the effects of transmeridian flight, shift work and seasonal affective disorders. These areas fall in the ambit of chronobiology. This discipline is growing steadily in India. The XV National Symposium on Chronobiology covered different subdisciplines such as chronopharmacology/chronotherapy, circadian mechanisms, chronoenocrinology, photoperiodism, pineal biology, circannual rhythms, molecular chronobiology, human chronobiology and shift work. The symposium provided a platform to about 75 participants that included 12 experts and 38 young students, for discussion/interaction in different sub-areas of chronobiology. There were 12 guest lectures and 14 oral presentations of papers by young researchers.

Biological rhythm research in India dates back to the first quarter of the last century. J. C. Bose reported short-term dates back to the first quarter of the last century. J. C. Bose reported short-term biological rhythms in terminal leaves of Indian telegraph plant, Desmodium gyrans. He was also the first to objectively document the phenomenon of persistence of the endodniurnal leaf movements in continuous light and darkness1. Now we would call such rhythms as being ultradian (1-min rhythm in lateral leaflets) and circadian (24-h rhythm in terminal leaves). However, there was a long gap between the work of Bose and the earliest work of Thapliyal2 and Chandrashhekaran3. The latter workers attracted many young Indians to pursue research work in diverse areas of chronobiology. Thereafter, two distinct schools evolved and contributed significantly to the growth of chronobiology in India2. The Department of Science and Technology (DST), New Delhi included it in the list of identified thrust areas since 1980.

Radha Yegnanarayan (B. J. Medical College, Pune), President of Indian Society of Chronobiology, in her keynote address, ‘Chronotherapy: experiments and experiences’, highlighted the importance of timed administration of drugs in clinics. She reviewed the current status of chronobiological research in medical colleges in India. In our opinion, chronobiology is still struggling to find its rightful place in the application domain. The textbooks used in medical colleges do not provide information other than that of plain documentation of circadian rhythm in cortisol.

Selection of models for the study of biological rhythms is supposed to be crucial. G. Marimuthu (MKU, Madurai) and M. Singaravel (BHU, Varanasi) presented plenary lectures on mechanisms of circadian rhythm in excellent models. Marimuthu talked about circadian rhythms in locomotor activity of the cave-dwelling millipede, Glyphiulus caverniculus sulu and in the flight/rest activity of the troglobene bat, Hipposideros speoris. It is indeed always interesting to study biological rhythms in cave organisms, as they inhabit subterranean spaces characterized by perpetual darkness, relatively constant temperature and humidity. He pointed out that cave millipedes still retain their ability to measure the passage of time and that the cave-dwelling bats effectively use social cues to synchronize their circadian rhythms in foraging behaviour. A. K. P. (Pt. Ravishankar Shukla University, Raipur) suggested that all caves should not be presumed to be clueless as regards time. He categorically pointed out that there could be a cascade of nonphotic cues present inside true caves. He further speculated that daily rhythm in sound-emitting behaviour in bats could act as effective zeitgeber(s) for cavernicolous.

Singaravel emphasized that the hemimetabolous insects are a good model to study circadian rhythm. He presented work on the circadian locomotor activity rhythm in the cricket, Gryllus bimaculatus and demonstrated that 5-hydroxytryptophan (HTP) plays an important role in insect circadian system. Further, he pointed out that elevated level of serotonin modulates the phase-shifting effects of HTP.

Melatonin controls the annual reproductive rhythm in Indian catfish. P. Nath (Visva-Bharati, Santiniketan) and B. Lal (BHU, Varanasi) supported this statement in their guest lectures. It was shown that melatonin mediates photothermal signals for the seasonal development of gonads. Lal emphasized that temporal organization of the hypothalamic–thyroid–gonadal hormones is a prerequisite for the attainment of a season-specific reproductive state. Nath elaborated that this endocrine axis operates through the involvement of melatonin. Lal explained that the role of pineal and lateral eyes in the reproductive cycle of catfish might be different at different times of the year.

S. Rani (LU, Lucknow) and A. Kar (DAU, Indore) presented data to show that wavelength and intensity of light influence circadian and circannual responses in birds respectively. Rani pointed out that birds (Emberiza melanocephala) were more active in red: red compared to blue: blue, and in blue: red compared to red: blue. She suggested that the circadian oscillators in E. melanocephala exhibit phase-dependent responsiveness to different light wavelengths. Kar added that factors like humidity, temperature and food intake considerably modulate circannual rhythm in reproduction of many wild species of birds. D. Bhattacharya (GKU, Hardwar) pointed out that in spotted munia (L. punctulata), the body-weight cycle parallels the reproductive cycle. He presented data showing entrainability of the reproductive cycle of spotted munia under carefully simulated shortened (T = 6 months) and reversed annual photocycles. K. K. Sharma (Jammu Cooperative College, Jammu) talked on the chronology of song production and associated behaviours of the tropical weaver finch, Ploceus philippinus.

A. Jagota (Univ. of Hyderabad, Hyderabad) presented data on normal photo-regulation of reproduction in female anophthalmic mutant rats. She explained that the reproduction is regulated by light in anophthalmic rats and that light is per-
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ceived through a non-visual system. This requires further confirmation, as mammals do not possess an ability to perceive extraoptic light signals. P. Subramanian (Annamalai Univ., Annamalainagar) presented data on the circadian patterns of expression of per in Cry and vg mutants of Drosophila melanogaster. He reported expression of per in the salivary gland of 3rd instar larvae, suggesting the presence of peripheral oscillators during the developmental stages of D. melanogaster.

DST is playing a crucial role to increase scientific activities in the domain of chronobiology in our country. The PAC-approved five-year cycle of the SERC School in Chronobiology is currently on. DST, ICMR and CSIR supported this symposium.


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RESEARCH NEWS

Telomere shortening: A marker of atherosclerosis?

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Telomeres are nucleoprotein complexes at the ends of chromosomes, consisting of tandem arrays of TTAGGG nucleotide repeats. They are essential for chromosomal stability and for preventing degradation and abnormal chromosomal recombinations. Telomeres are considered as a replicometer, which counts cell divisions and ultimately triggers replicative senescence, and they act as cellular ‘sentinels’ for genomic damage (Box 1). The fact that telomeres trigger replicative senescence has been supported by three observations. First, telomeres shorten with each population doubling in primary human cell cultures, but stop shortening in non-dividing cells. Second, immortal cells, whether single-cell organisms, germ line cells or tumour cells express in their vast majority active telomerase, the enzyme that binds to the single-stranded 3’ end of the telomere and re-elongate it. Third, human fibroblasts, which display telomere shortening and senescence, can be immortalized solely by transfection with the catalytic subunit of human telomerase, hTERT; this transfection results in the restoration of functional telomerase and elongation of telomeres. In utero, telomere length is similar in most tissues but during extraterine life, telomeres progressively shorten in proliferative somatic cells and their length diminishes with age. Based on studies in twins, telomere length seems to be familiar and recently, its mode of inheritance has been described to be X-linked.

Recent studies propose that telomere shortening is a marker of biological ageing.