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Identification of the Mechanism Underlying the Circadian Clock's Disruption Induced by Abnormal Salt Concentration Using Genetically Modified Zebrafish

Jun Hirayama

Department of Clinical Engineering, Faculty of Health Sciences, Komatsu University

Summary

The circadian clock generates behavioral rhythms to maximize an organism's physiological efficiency. The circadian clock is established by cell-autonomous oscillators called cellular clocks, which are present in every cell of a living organism. The synchronization of cellular clocks in tissues and organs by light is required to orchestrate the circadian clock at the organismal level. Previous studies have provided several lines of evidence that salt of high concentration have effect on circadian clock. Aim of the current study is to reveal the mechanism underlying the dysregulation of circadian clock induced by salt of high concentration by the use of zebrafish as experimental model animal.

Phase of cellular clocks are synchronized to establish functional circadian clocks at animal levels when treated with environmental stimuli, such as light. Thus, circadian rhythms in locomotor activity in zebrafish larva emerge only if embryos are exposed to environmental signals, with light being the most important signal. Current study tested behavior rhythm of zebrafish larvae to evaluate circadian clock at animal. The behavior of zebrafish were tracked by the DanioVision Tracking System (Noldus Information Technology). As the result, the current study identified the candidate molecules which are involved in circadian clock dysregulation induced by salt of high concentration. The disruption of genes coding them suppressed the light-dependent formation of circadian rhythm in behavior of zebrafish. It has been reported that stress factors induce dysregulation of circadian clocks. The disruption of circadian clocks can have a profound effect on animal health, and is linked to a variety of diseases, including sleep disorders, metabolic syndrome, and cancer. To understand how salt of high concentration induces dysregulation of circadian clocks would contribute to developing lifestyle intervention strategies to improve human health.