Nocturia induced by the restraint stress is involved with alternation of circadian gene expression in the mouse bladder.

Introduction

- We reported that the sensation of bladder fullness had circadian rhythm through gene expression rhythm of mechano-sensors such as Piezo1 and TRPV4 under the regulation by clock genes in the mouse bladder urothelium (1). Then, Urination behavior showed circadian rhythm, and the abnormalities of clock genes might cause nocturia because of the loss of circadian bladder function such as the sensation of bladder fullness.

- Circadian regulations of clock genes are altered by some types of intermittent stress, such as restraint stress (RS), only in peripheral organs in mice (2).

Methods

- Male C57BL/6 (WT) mice and Period2 luciferase and RS mice. mRNA in the mucosa in control mice and RS mice. mRNA in the bladder for Per2::Luc mice was compared with WT mice. Furthermore, the oscillation pattern was altered in RS mice.

Conclusions

The circadian gene expressions in clock genes were altered by intermittent RS during the rest phase, sleep phase in mice, which might induce nocturia through the abnormal circadian expression of mechano-sensors.

These results indicated that exposure to stress could be one of the causes of nocturia. Further studies may provide new therapeutic strategies for nocturia.

References

1) Ihara, T., Mitsui, T., Nakamura, Y. et al.: The oscillation of intracellular Ca^2+ influx associated with the circadian expression of Piezo1 and TRPV4 in the bladder urothelium. Sci Rep, 2017

2) Tahara, Y., Shiraishi, T., Kikuchi, Y. et al.: Entrainment of the mouse circadian clock by sub-acute physical and psychological stress. Sci Rep, 2019