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RESEARCH AREA

The circadian time-keeping system enables the organism to anticipate the daily environmental changes and therefore is a crucial factor of adaptation. The endogenous rhythm is generated at the cellular level by a mechanism based on the action of interconnected transcription/translation feedback loops. The circadian system has a central pacemaker in the suprachiasmatic nucleus (SCN), which may coordinate and synchronize the peripheral oscillators present in other tissues through neuronal and humoral pathways. The main regulator of the SCN is light, but the peripheral clocks can also be modified by metabolic effects (e.g. food intake and its timing). Cellular clock function influences a wide range of physiological and pathological processes, e.g. both activity of the immune system and leukocyte migration have a characteristic circadian rhythm. Our investigations focus on the following questions: 1.) Which neural, humoral, hormonal and metabolic factors influence the circadian rhythm of immune functions? 2.) Which clock proteins control the effector functions of immune cells? 3.) What kind of individual differences can be detected in the clock function of the immune system? 4.) How does the circadian rhythm of the immune system change in different inflammatory and metabolic diseases and in sepsis? 5.) Is a cell's own molecular clock necessary for the control of rhythmic processes or is the operation of the central clock in the SCN sufficient? Understanding the regulation of the rhythmic immune system activity may help to identify therapeutic targets or design complementary therapeutic tools. For example, development of chronotherapeutic (time-dependent drug administration) strategies and design of individualised therapy for various inflammatory or other immune-related diseases could be possible.

TECHNIQUES AVAILABLE IN THE LAB

Genotyping and crossing of mouse strains, bone marrow transplantation in mice, isolation of human and murine leukocytes from blood and tissue samples, investigation of leukocyte functions, microscopic techniques, RNA isolation, analysis of gene expression with real-time PCR, culturing and genetic modification of cell lines, flow cytometry, ELISA, following promoter activity by in vivo luciferase assay, protein analysis with Western blot, examination of protein-protein interactions, analysis of the sleep rhythm in human.

SELECTED PUBLICATIONS

Sűdy, Á., **Ella, K.**, Bódizs, R., Káldi, K. (2019) Association of Social Jetlag With Sleep Quality and Autonomic Cardiac Control During Sleep in Young Healthy Men. **Front Neurosci 13:** 950.

Gyöngyösi, N., Szőke, A., **Ella, K.**, Káldi, K. (2017) The small G protein RAS2 is involved in the metabolic compensation of the circadian clock in the circadian model Neurospora crassa. **J Biol Chem 292:** 14929-14939.

Ella, K., Csépányi-Kömi, R., Káldi, K. (2016) Circadian regulation of human peripheral neutrophils. **Brain Behav Immun 57:** 209-221.

Haraszti, R., **Ella, K.**, Gyöngyösi, N., Roenneberg, T., Káldi, K. (2014) Social jetlag negatively correlates with academic performance in undergraduates. **Chronobiol Int 31:** 603-612.

Gyöngyösi, N., Nagy, D., Makara, K., **Ella, K.**, Káldi, K. (2013) Reactive oxygen species can modulate circadian phase and period in Neurospora crassa. **Free Radic Biol Med 58:** 134-143.