Commentary

Timing of lymphocyte trafficking is regulated by the circadian clock

Alexandre Morrot

Institute of Microbiology, Federal University of Rio de Janeiro, Rio de Janeiro, Brazil; Oswaldo Cruz Institute, Oswaldo Cruz Foundation, Rio de Janeiro, Brazil

Correspondence to: Dr. Alexandre Morrot. Institute of Microbiology, Universidade Federal do Rio de Janeiro (UFRJ), CCS-Sala D1-035, Av. Carlos Chagas Filho, 373-Cidade Universitária, CEP 21.941-902, Ilha do Fundão, Rio de Janeiro, RJ, Brazil. Email: morrot@micro.ufrj.br.

Comment on: Druzd D, Matveeva O, Ince L, *et al.* Lymphocyte Circadian Clocks Control Lymph Node Trafficking and Adaptive Immune Responses. Immunity 2017;46:120-32.

Submitted Feb 11, 2017. Accepted for publication Feb 15, 2017.
doi: 10.21037/atm.2017.03.27
View this article at: http://dx.doi.org/10.21037/atm.2017.03.27

Biological systems are composed of a set of genes encoding the synthesis of functional gene products. Their functions can relate to each other in a balanced way to weigh the exact importance of each product at the appropriate time. This dynamic relationship among genes, their functions, time, and the environment is dictated in organisms by endogenous circadian rhythms (1). The "clock" that processes and monitors all these processes is in a brain area called the suprachiasmatic nucleus (SCN). It is just above the pituitary gland, in the hypothalamus, the cerebral region that connects the neuroendocrine and immune systems. Interactions at the neuronal network of the SCN guarantee the circadian rhythms at the organismal level (2). The synchronization of the work among tissues, organs, and physiological systems is of extreme importance for the immunological system during the acquisition of the immune response to an infection. The circadian system is able to analyze the behavior of the biological systems and promote phase coherence to coordinate and synchronize the immune system in response to environmental dynamics such as vulnerabilities to infection and diseases (2). Recent studies have demonstrated that lymphocytes, the major players in adaptive immunity, circulate by a circadian mechanism among the lymphoid organs in their search for antigens (3). The migration of B and T lymphocytes to the lymph nodes peaks at the onset of night, while during the day, these cells leave the immunological organs to compose a reservoir of leukocyte cells that is ready to perform their functions while patrolling the organism. These studies have shown that the mechanisms governing the circadian rhythmicity of these cells depend on modulation of temporal expression of the trafficking receptors C-C chemokine receptor type 7 (CCR7) and sphingosine-1-phosphate receptor 1 (S1P1), which fluctuate in the kinetics of their expression in an opposite and complementary way (3). During the evening, the expression levels of CCR7 are high, ensuring the homing of lymphocytes to lymph nodes, while the expression of the S1P1 receptor critical for mediating lymphocyte egress becomes high during the day (3). These findings open a new perspective for studies aiming at an optimization of immunotherapeutic approaches and vaccine protocols for the acquisition of adaptive immune responses.

Acknowledgements

This work was supported by grants from Conselho Nacional de Desenvolvimento Científico e Tecnológico do Brasil (CNPq), Fundação de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ).

Footnote

Conflicts of Interest: The author has no conflicts of interest to declare

References

1. Panda S. Circadian physiology of metabolism. Science 2016;354:1008-15.

2. Labrecque N, Cermakian N. Circadian Clocks in the Immune System. J Biol Rhythms 2015;30:277-90.
3. Druzd D, Matveeva O, Ince L, et al. Lymphocyte Circadian Clocks Control Lymph Node Trafficking and Adaptive Immune Responses. Immunity 2017;46:120-32.

Cite this article as: Morrot A. Timing of lymphocyte trafficking is regulated by the circadian clock. Ann Transl Med 2017;5(Suppl 1):S21. 10.21037/atm.2017.03.27