Cellular Programs

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Summer Semester 2025 — Chair of Computational Biology

Assignment 1

Handed out: 15.02.25

Due: 22.02.2025 10.00 am

Submit your solutions by e-mail with a single PDF attachment

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Every student should submit his/her own solution. Plagiarism of solutions will be penalized. Indicate whether you used AI tools. Label your assignment sheet with your name and matriculation number. Don't exceed specified page lengths by more than 0.25 pages.

All problems refer to paper #2: Sandra March et al. Science Advances, 10, eadm9281 (2024).

Problem 1:

Fig. 1(B) visualizes "Bmal1 expression (RLU)" according to the y-axis label. On the other hand, the figure legend states that "light emission of luciferase" was monitored. Which information is correct? Explain the experiment: why do PHH cells emit light signals? What is the origin of the light emission? What determines the strength of the signal? Why does the black solid line in Fig. 1(B) reflect circadian Bmal1 expression? (0.25 page).

Problem 2:

Fig. 3A shows that the expression level of CYP3A4 is highest at 24h circadian time. On the other hand, Fig. 3B shows that CYP3A4 activity is highest at 36h circadian time. How do you explain the time shift between Fig. 3A and Fig. 3B? (0.25 page)

Problem 3:

Fig. 3F shows that circadian hepatoxicity to the chemical atorvastatin (ATOV) is increased after 24h when expression of Bmal1 is silenced by applying siRNA. How do you explain this effect of Bmal1? (0.25 page)