Circadian dynamics of the teleost skin immune system–microbiome interface

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Video Byte

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Abstract

The immune systems of fish and other animals follow circadian rhythms related to light/dark cycles. In aquaculture, the light period is commonly lengthened to enhance growth and control reproduction, but the effects on fish immunity are unclear and parasite infestations and infectious diseases remain major challenges to the industry, so a better understanding of fish immunity is needed. Microbial communities living on fish's skin - their microbiome - can help defend against parasites and pathogens, but it is currently unknown if they too have daily rhythms. To learn more, researchers recently characterized the circadian dynamics of clock genes, immune genes, and microbes in the skin of rainbow trout. They found that skin immune gene expression and the skin microbiome exhibited daily rhythms. These rhythms were affected by both a change in photoperiod and infestation with lice (*Argulus foliaceus*), and fish under constant light were less able to defend themselves against lice infestation. In addition, clock gene and immune gene expression profiles appeared to be linked with the skin microbiome composition. Although further research is needed to determine the direction of the association (whether the genes affect the microbiome, or vice versa), the results reveal that circadian rhythm disruption can impair fish health by altering the immune system and skin microbiome and suggest that “chronotherapies” that leverage daily rhythms might be useful in the aquaculture industry.