SLEEP

A mouse sleep database for systems genetics

Diessler, S. et al. *PLoS Biol* **16**, e2005750 (2018).

Did you get the National Sleep Foundation's recommended 7 to 9 hours of shut eye last night? If you didn't (and you aren't alone), you're probably feeling it today. Why we need to sleep in the first place remains elusive, but a team of researchers and data scientists working with Paul Franken at the University of Lausanne and Ioannis Xenarios at the SIB Swiss Institute of Bioinformatics have assembled a big data resource that could hold new insight into why we feel so sluggish after a fitful night.

Like many a prior sleep study, they used mice. But not just one or two strains, as is often typical in reductionist approaches that try to link a particular gene to an outcome. Franken's latest publication involves a much more diverse selection of animals, in order to evaluate the effects of sleep deprivation from a systems genetics approach. Systems genetics attempts to understand how biological information flows from to DNA to phenotype in populations rather than individuals. It's an emerging field, and it takes a lot of data.

The team assembled a database containing measurements of sleep-wake patterns, central (brain) and peripheral (liver) gene expression, and plasma metabolites from 33 different mouse strains randomly chosen from the BXD genetic reference population (a resource of over 150 recombinant inbred mouse lines), from the reference population's two parent strains, C57BL/6J and DBA/2J, and from first-generation progeny of reciprocal parent crosses.

The researchers recorded the data while the animals slept normally to compare against any changes resulting from experimenter-induced sleep deprivation. They then had to analyze and interpret all those values. It was like "learning to swim in a data lake!" Franken says. "I completely underestimated the systems level analyses part of the study, which took as long, if not longer, than the breeding, data collection, and the first-level analyses."

The project took over nine years from concept to first publication, but their results reveal that even a single night of disrupted sleep can alter gene expression and plasma metabolites across the varied mouse strains. "From a strictly basic research point of view, the resource points to novel pathways activated by sleep loss and important in determining recovery sleep," says Franken. "Hopefully these observations will bring us closer to answering the big question of why we sleep and why curtailed sleep or disturbed sleep is detrimental to performance, well-being, and health."

There are many points Franken plans to follow up on in future publications, but in the meantime, the entirety of the data they collected from their diverse mouse population is freely available online and can be accessed at https://bxd.vital-it.ch for others to explore.

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Published online: 24 September 2018
https://doi.org/10.1038/s41684-018-0163-z