The internal clock and feeding rhythm set the pace of the liver

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Living organisms have adapted to the day-night cycle and, in most cases, they have evolved a "circadian clock". Its effects are not completely known yet but its functioning has been shown to have important metabolic consequences for the body. Disruption of normal circadian rhythms can have deleterious effects on health; for example lack of sleep is linked with obesity, and the time of feeding was shown to affect the ability to control body weight.

Scientists from the Nestlé Institute of Health Sciences (NIHS) and the École polytechnique fédérale de Lausanne (EPFL), supported by a 2012 grant from the Swiss Leenaards Foundation originally awarded to the Université de Lausanne, have found that in the case of the liver, the rhythm of protein production and release is dictated by both the organisms' feeding behaviors and their internal clock. The current study was published last week in the journal *Proceedings of the National Academy of Science* (*PNAS*).

The researchers, under the direction of Frédéric Gachon (NIHS) and Felix Naef (EPFL), analyzed liver proteins with mass spectrometry, one of the new analytical tools currently available that allow a closer inspection of the real impact of this clock on some biological processes, in particular at a level of temporal protein abundance. They measured the concentration of more than 5000 different proteins – whereas previous techniques only allowed the identification a few hundreds at best.

The results suggest that the circadian clock does not only influence the production of proteins by the genes, but also the way the liver regulated the storage and release of proteins into the body. "Our experiments seem to prove that the pace set by feeding patterns takes precedence over the circadian rhythm. However, it appears that the strongest effect takes place when these two rhythms overlap", said Frédéric Gachon.

As a next step, this research will attempt to translate some of these results to humans. "Our work will help develop strategies focused on diet to help treat patients suffering from disorders associated to circadian dysfunctions" said Felix Naef.

Provided by Ecole Polytechnique Federale de Lausanne

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