

Vital nutrient has key role in keeping body clocks running on time

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An essential mineral in our diets has an unexpected role in helping living things remain adapted to the rhythms of night and day, scientists have found.

Magnesium - a nutrient found in many foods - helps control how [cells](#) keep their own form of time to cope with the natural environmental cycle of day and night.

The discovery in cells is expected to be linked to whole body clocks which influence daily cycles - or circadian rhythms - of sleeping and waking, hormone release, body temperature and other important bodily functions in people.

The surprising discovery may aid the development of chronotherapy - treatment scheduled according to time of day - in people, and the development of new crop varieties with increased yields or adjustable harvesting seasons.

Experiments in three major types of biological organisms - [human cells](#), algae, and fungi - found in each case that levels of [magnesium](#) in cells rise and fall in a daily cycle.

Scientists found that this oscillation was critical to sustain the 24-hour clock in cells. They were surprised to discover that it also had an enormous impact on metabolism in cells - how fast cells can convert nutrients into energy - throughout the course of a day.

Researchers at the University of Edinburgh and the MRC Laboratory for Molecular Biology in Cambridge used molecular analysis to find that concentrations of magnesium rose and fell in a 24-hour cycle in all cell types, and that this impacts on the cells' [internal clocks](#).

Further tests showed that magnesium levels were linked to the cells' ability to burn energy. It was already known that magnesium is essential to help living things convert food into fuel, but scientists were surprised to discover that it also controls when this biological function takes place, and how efficiently.

Their study, published in *Nature*, was supported by the Royal Society, the Medical Research Council and the Wellcome Trust.

Dr Gerben van Ooijen, of the University of Edinburgh's School of Biological Sciences, who led the study, said: "Internal clocks are fundamental to all living things. They influence many aspects of health and disease in our own bodies, but equally in crop plants and micro-organisms. It is now essential to find out how these fundamentally novel observations translate to whole tissue or organisms, to make us better equipped to influence them in complex organisms for future medical and agricultural purposes."

The study's other senior author, Dr John O'Neill of the MRC Laboratory of Molecular Biology in Cambridge, said: "Although the clinical relevance of magnesium in various tissues is beginning to garner more attention, how magnesium regulates our body's internal clock and metabolism has simply not been considered before. The new discovery could lead to a whole range of benefits spanning human health to agricultural productivity."

More information: Daily magnesium fluxes regulate cellular timekeeping and energy balance, *Nature*, [DOI: 10.1038/nature17407](https://doi.org/10.1038/nature17407)

Provided by University of Edinburgh

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