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Short-term changes in human metabolism following a 5-hour delay of the light-dark and behavioural cycle

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The circadian timing system regulates many aspects of metabolic physiology, including the postprandial response to meals⁽¹⁾. Experimental inversion of circadian and behavioural rhythms by 12 hours adversely affects markers of metabolic health⁽²⁾. We investigated effects of a more modest 5-hour delay in behavioural cycles.

Fourteen participants completed an 8-day in-patient laboratory protocol, with controlled sleepwake opportunities, light-dark cycles, and diet. The 5-hour delay in behavioural cycles was induced by delaying sleep opportunity. We measured: melatonin to confirm central circadian phase; fasting markers and postprandial metabolism; energy expenditure; subjective sleepiness; and appetite, throughout the waking period.

After the phase delay, there was slower gastric emptying at breakfast, lower fasting plasma glucose, higher postprandial plasma glucose and triglycerides, and lower thermic effect of feeding. Any changes were abolished or attenuated within 48-72 hours. Further, we show no difference in 16 h waking energy expenditure.

These data extend our previous findings, which showed no time-of-day effect on energy expenditure in healthy adults.

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