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# Caffeine consumption slows down brain development

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Humans and other mammals show particularly intensive sleeping patterns during puberty. The brain also matures fastest in this period. But when pubescent rats are administered caffeine, the maturing processes in their brains are delayed. This is the result of a study supported by the Swiss National Science Foundation (SNSF).

Children's and young adults' average caffeine consumption has increased by more than 70 per cent over the past 30 years, and an end to this rise is not in sight: the drinks industry is posting its fastest-growing sales in the segment of caffeine-laden energy drinks. Not everybody is pleased about this development. Some people are worried about possible health risks caused in young consumers by the pick-me-up.

Researchers led by Reto Huber of the University Children's Hospital Zurich are now adding new arguments to the debate. In their recently published study conducted on rats, the conclusions call for caution: in pubescent rodents, caffeine intake equating to three to four cups of coffee per day in humans results in reduced deep sleep and a delayed brain development.

## Peak level during puberty

Both in humans and in rats, the duration and intensity of deep sleep as well as the number of synapses or connections in the brain increase during childhood, reaching their highest level during puberty and

dropping again in adult age. "The brain of children is extremely plastic due to the many connections," says Huber. When the brain then begins to mature during puberty, a large number of these connections are lost. "This optimisation presumably occurs during deep sleep. Key synapses extend, others are reduced; this makes the network more efficient and the brain more powerful," says Huber.

## Timid instead of curious

Huber's group of researchers administered moderate quantities of caffeine to 30-day-old rats over five days and measured the electrical current generated by their brains. The deep sleep periods, which are characterised by slow waves, were reduced from day 31 until day 42, i.e. well beyond the end of administering caffeine. Compared to the rats being given pure drinking water, the researchers found far more neural connections in the brains of the caffeine-drinking animals at the end of the study. The slower maturing process in the brain also had an impact on behaviour: rats normally become more curious with age, but the rats consuming caffeine remained timid and cautious.

The brain goes through a delicate maturing phase in puberty, during which many mental diseases can break out. And even if the rat brain differs clearly from that of humans, the many parallels in how the brains develop raise the question as to whether children's and young adults' caffeine intake really is harmless or whether it might be wiser to abstain from consuming the pick-me-up. "There is still need for research in this area," says Huber.

**More information:** Olini, N., Kurth, S. and Huber, R. (2013). The Effects of Caffeine on Sleep and Maturational Markers in the Rat, *PLoS ONE* 8: e72539. DOI: 10.1371/journal.pone.0072539