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PRESS RELEASE

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SLEEPING BADLY MAKES US CRAVE JUNK FOOD BUT SLEEPING WELL COULD REDUCE DISEASE RISK

Sleeping badly means that we are not at our best during the day, increasing stress, lacking concentration – and, surprisingly, craving high-calorie or junk food. Researchers in Japan today (9 July) presented their findings into the link between sleep loss and the prefrontal cortex, an area of the brain involved with cognition, planning and decision-making. It also controls the desire to consume unhealthy foods as well as obesity and other health issues.

There are two distinct states of sleep, rapid eye movement (REM) sleep (during which we dream) and non-REM sleep. But an abnormal balance of the cycle of these two sleep states can be an indication of poor health. Poor sleep is characterised by less than six hours sleep for most people, and previous studies have shown that over the period of a year, this can lead to weight gain.

Professor Michael Lazarus from the University of Tsukuba, Japan, has been looking at the effects of REM sleep on the prefrontal cortex which is the part of the brain that selects the taste, smell and texture of food. “It appears that REM sleep loss leads to increased consumption of unhealthy foods, specifically sucrose and fat,” he said at the FENS Forum of Neuroscience in Berlin. “But the question is, why?”

To understand why, Professor Lazarus and his colleagues disrupted sleeping mice to mimic REM sleep loss and administered a drug to block the neurons (nerve cells) of the prefrontal cortex. They discovered that inhibiting these neurons reversed the effect of REM sleep loss and reduced sucrose consumption while having no effect on fat consumption. The effects of one injection of the drug lasted about three days.

“For the first time, our results provide evidence that the prefrontal cortex plays a direct role in controlling our desire to consume weight-promoting foods, high in sucrose content, when we are lacking sleep,” he said.

Eating high-calorie foods could inevitably lead to obesity, diabetes and heart disease. Therefore, understanding the link between sleep loss and how the brain is stimulated to crave high-calorie food could lead to new ways to improve sleep and reduce obesity, for example, a new remedy that increases the amount of REM sleep.

Disrupted sleep and lack of sleep are not only linked to the craving of high calorie foods, but it is also a symptom of many diseases, such as Alzheimer’s disease. **Dr Christelle Anaclet** from the University of Massachusetts Medical School, USA believes that enhancing sleep could reduce the burden of diseases. “But so far, we haven’t had efficient and specific sleep-promoting drugs to be able to test this hypothesis,” she said.

Two major sleep stages, rapid eye movement (REM) and non-REM (NREM) sleep are poorly understood. In her studies of how the brain regulates the sleep-wake cycle, Dr Anaclet’s

team developed mouse models of enhanced NREM or REM sleep that for the first time enabled them to test the respective role of REM and NREM sleep, not only in other functions, such as memory consolidation, but also in the progression of Alzheimer's and other neurological disorders.

"Everybody sleeps and sleep deficiency is ubiquitous. It affects people of all ages, socioeconomic status, races, and ethnicities," she explained. The American Academy of Sleep Medicine and the Sleep Research Society both regard the minimum amount of sleep required in adults to promote optimum health is seven hours a night. Around 35-40% of Americans sleep less than seven hours a night.

In previous studies, Dr Anaclet discovered a population of sleep-promoting neurons located deep within the brain stem in an unknown area she named the parafacial zone. In subsequent laboratory experiments in mice she showed that activation of these neurons induces deep and long-lasting sleep within a few minutes. She is now studying how they influence sleep and looking for a target that could be activated by a drug to induce deep sleep.

Understanding how the brain sleeps and the beneficial role of sleep is necessary not only to uncover new biological targets for developing safer drugs but also to develop interventional strategies to reduce the burden of many diseases.

END

Symposium: S22 - The mystery of rapid eye movement sleep: New circuits and insights

Abstracts: M Lazarus - The link between REM sleep loss and the desire for junk food
C. Anaclet - Understanding sleep function using sleep-enhancement rodent models

Contact

FENS Press Office and all media enquiries:

Elaine Snell, Snell Communications Ltd, London UK (*English language*)

tel: +44 (0)207 738 0424 or mobile +44 (0)7973 953794

email: Elaine@snell-communications.net

Barbara Ritzert, ProScience Communications, Pöcking, Germany (*German language*)

tel: +49 8157 9397-0 or mobile +49 151 12043311

email: ritzert@proscience-com.de

NOTES TO EDITORS

Professor Michael Lazarus, International Institute for Integrative Sleep Medicine, University of Tsukuba, Japan <http://www.wpiiiiislazaruslab.org/>

Dr Christelle Anaclet, Department of Neurobiology, University of Massachusetts Medical School, Worcester, MA, USA <https://profiles.umassmed.edu/display/14646425>

The 11th FENS Forum of Neuroscience, the largest basic neuroscience meeting in Europe, organised by FENS and hosted by the German Neuroscience Society will attract more than 7,000 international delegates. The Federation of European Neuroscience Societies (FENS) was founded in 1998. With 43 neuroscience member societies across 33 European countries, FENS as an organisation represents 24,000 European neuroscientists with a mission to advance European neuroscience education and research. <https://forum2018.fens.org/>

Further reading (Lazarus)

Chemogenetic inhibition of the medial prefrontal cortex reverses the effects of REM sleep loss on sucrose consumption K McEown, Y Takata, Y Cherasse, N Nagata, K Aritake, M Lazarus *eLife* 2016;5:e20269. **DOI: 10.7554/eLife.20269**