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Effects of Nutrient Composition of Dinner on Sleep Architecture and Energy Metabolism during Sleep

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Summary

Energy metabolism and substrate oxidation during sleep correlate with sleep stage, suggesting that energy metabolism affects sleep architecture or vice versa. Aim of the present study was to examine whether changes in energy metabolism during sleep, induced by high carbohydrate or high fat diet for dinner, affects sleep architecture. Ten healthy males participated in this study, who slept 3 nonconsecutive nights in a whole-room calorimeter. The first night was scheduled as an adaptation to experimental environment. The other 2 nights were experimental calorimetry in a balanced cross-over design with intrasubject comparisons. In each session, subjects consumed high carbohydrate (HCD: PFC = 10:10:80) or high fat (HFD: PFC = 10:78:12) meal at 2000h and slept with a polysomnographic recording in a metabolic chamber for indirect calorimetry (0000h to 0800h).

Slow wave sleep was decreased during the first sleep cycle and not changed during the second and third sleep cycle in HCD condition compared with those of HFD. Energy expenditure was not affected by dietary condition but substrate oxidation reflected differences in dietary composition of the dinner during the first and second sleep cycle. Present study suggested the possibility that substrate availability during sleep affects substrate oxidation during sleep, and affects sleep architecture during the first sleep cycle. Three xylanases induced by xylan from *Streptomyces* sp. no. 3137 were purified to homogeneity. The enzymatic, physicochemical, and immunological properties of the enzymes were compared with those of three xylanases induced by non-metabolizable methyl β -xyloside. It was found that each xylanase produced under different culture conditions showed very similar properties.

睡眠時のエネルギー代謝と酸化基質は睡眠ステージと関連があり、その関連は反対にエネルギー代謝が睡眠に影響を与えているという仮説にも繋がる。本研究では、夕食の栄養素組成の違いがその後の睡眠時に利用される酸化基質に引き起こす変化を介して、睡眠構造に影響を与えるか否かを調べることを目的とした。被験者は、睡眠に問題のない健康的な10人の若年成人男性を対象とした。本試験では被験者は20:00に夕食【高炭水化物食 (HCD: PFC=10:10:80) または高脂肪食 (HFD: PFC=10:78:12)】を摂取し、00:00に消灯し08:00まで睡眠ポリグラフィ (R&Kにて睡眠段階を判定) とヒューマン・カロリメータを用いて睡眠時脳波とエネルギー代謝の測定を行った。

HCDとHFDとの比較において、深睡眠はHCDでは睡眠の第一周期で有意に減少し、第二周期と第三周期では差は見られなかった。一方、エネルギー消費量は影響を受けなかったが酸化基質には差が認められ、HFDと比較しHCDでは睡眠の第一周期と第二周期における炭水化物酸化量は有意に増加し、脂質酸化量は有意に減少した。本研究では夕食の栄養素組成が睡眠時に利用される酸化基質に影響を与え、特に第一周期の睡眠構造に影響を及ぼす可能性を示した。