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Chrono-Nutrition Study on Salt Intake and Excretion in Mouse

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Summary

Circadian rhythm in our body can control many physiological functions including feeding behavior, absorption of nutrition and excretion of urine/sodium ions. In this research we examined whether food intake of salt containing food can reset peripheral circadian clock. Mice can take food 4 hrs during daytime and 4 hrs during nighttime. Four different experimental conditions were prepared; (1) 8% salt containing diet (SD) during day + normal diet (ND) during night, (2) ND during day + SD during night, (3) SD during day and night, (4) ND during day and night. No (2) mice showed almost same amount food during day and night, but other groups (1), (3), (4) showed high food intake during night than day because of control of circadian rhythm. Mice of (2) took more ND during day to avoid the SD during night. No (2) mice showed the advance of phase of kidneycircadian clock compared to No (1) mice evaluated by bioluminescence rhythm of *Per2::luc* KI mice. These data suggest us that food intake of unpreferred food may affect circadian rhythm.

Some paper demonstrated that sweet sensitivity is controlled under circadian system. In the next experiment, we examined whether clock mutation can affect the preferred selection of bottle from two bottles (water vs sucrose/salt, water vs sucrose + salt). Both wild and Clock-/- mice preferred the sugar bottle (60% preference for 10% sucrose, 90% for 30% sucrose). Clock-/- mice showed the avoidance salt containing bottle in comparison to wild mice, when two bottles (water vs 10% or 30% sucrose + 2% salt) were presented. Salt water (1% or 2%) was orally administered to mice, and then urine and sodium ions volume were measured for 5-hr up. Clock-/- mice showed the lower level of urine and sodium ions than wild mice. These data suggest that Clock-/- mice possess the abnormality of salt excretion, therefore they avoid taking salt in two bottles preference test. Not only clock gene mutation but shift-work may affect the preference of salt and salt excretion, and may result in salt-induce hypertension.