SLEEP IMPROVING EFFECTS OF MILK

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INTRODUCTION

Nutrition influences sleep. Drinking a glass of warm milk in the evening has been a long term tradition in several cultures. Although most of these reports are anecdotal, several milk components have been associated with sleep, such as tryptophan, bioactive peptides and magnesium. The widest researched dairy component in relation to sleep is tryptophan. Tryptophan is the precursor of serotonin. A good source of tryptophan is alpha-lactalbumin, a major protein found in whey. Evening alpha-lactalbumin consumption results in increased tryptophan levels in the blood and improves cognitive performance in stress-vulnerable subjects and reduced sleepiness the following morning.[1,2] The disadvantage of alpha-lactalbumin is that a rather large dose is required to reach a significant amount of tryptophan. Pure tryptophan may be an alternative.[3]
As a source of bioactive peptides, a tryptic casein hydrolysate has been shown to have anti-stress properties[4,5] and showed sleep improving effects in rats.[6] Magnesium, another component of milk, may be beneficial in reducing complaints concerning restless legs/periodic limb movement disorder and improvement of sleep efficiency.[7]
We conducted a short-term trial in home settings with milk products in women aged 45+ with sleeping problems. We hypothesised that dairy and especially dairy products enriched with magnesium and either tryptophan or a specific casein hydrolysate would be beneficial in reducing sleeping disturbances.

METHODS

The study was performed according to a double-blind, randomized, reference-controlled, three-way cross-over design in 15 women with moderate insomnia. The study consisted of a one week baseline period (day –7 to –4), followed by three treatment weeks (day 1 to 4, day 9 to 11, day 15 to18) and one week follow-up (day 22 to 25). All 4 day treatment periods were followed by a 3 day wash-out period (no treatment). Participants were randomised to one of the three different treatment orders (ABC, BCA, CAB) using Latin square design. During treatment, subjects consumed 250 ml of either (A) reference milk, (B) milk enriched with casein hydrolysate and magnesium (CH milk), or (C) milk enriched with tryptophan, magnesium and niacin (TRP milk), daily one hour prior to sleep.
Outcome measures were sleep efficiency (=total sleep time/total time in bed x 100%), sleep quality (Groningen Sleep Quality Scale, score from 0-13 of which highest score indicate bad sleep quality), sleep time, time awake and number of awakenings during the night.
Treatment effects were investigated with analysis of variance. If ANOVA indicated a treatment effect , comparisons between treatment means of the parametes were performed using a 2-sided (paired) Student t-test. The change in the treatment periods 1 to 3 as compared to run in or follow uw were analysed using a split-plot design procedure. The

variant 'change' is defined as the difference between the Run-in measures versus the measures at the end of the treatment period. To account for the different treatment orders the factor 'period' was entered in the model. This test was performed for each treatment separately.

RESULTS

Sleep time, time awake, number of awakenings and sleepiness were not affected by treatment. Compared to run-in, all milk treatments increased mean (SD) total sleep time with 30 (21) min. Sleep efficiency improved with reference and CH milk. Sleep quality improved with reference milk and CH milk, with 1.5 (S.E. 0.6; p=0.002) and 2.3 (S.E. 0.6; p<0.0001) points respectively. Effects of reference milk were not consistent throughout the study. In Table 1 the mean values and the statistical evaluation are presented for the change in sleep parameter by each treatment as compared to run-in.

Table 1. Change in sleep measures by treatment as compared to baseline run-in

Treatment	*Period 1*	*Period 2*	*Period 3*	*Mean*	*SE*	*ANOVA-P-value*	
						Treatment	*interaction*
Total sleep time (minutes)							
Reference milk	-21.3	51.7*	76.3**	35.6	19.4	0.0079	0.0103
CH milk	55.4*	-3.0	42.5*	31.6	18.4	0.0117	0.1025
TRP milk	11.9	64.8*	1.1	25.9	23.3	0.0787	0.1610
Sleep efficiency (%)							
Reference milk	-3.67	10.27*	14.68**	7.1	3.7	0.0065	0.0119
CH milk	7.28*	1.64	7.74*	5.6	3.3	0.0125	0.3720
TRP milk	2.30	10.99*	0.25	4.5	4.5	0.1067	0.2386
Sleep quality							
Reference milk	0.6	-2.4**	-2.6**	-1.5	0.64	0.0018	0.0064
CH milk	-2.1**	-1.9*	-2.8**	-2.3	0.67	<0.0001	0.5922
TRP milk	-1.0	-0.9	-0.1	-0.7	0.87	0.2187	0.7399

Data: change calculated as treatment value minus run-in value. 'Period' represents the group of five subjects receiving the treatment in that period. TRP: tryptophan, niacine and magnesium enriched milk, CH: casein hydrolysate and magnesium enriched milk. Indicators of values different from 0: *P<0.05; **P<0.001

DISCUSSION

Milk enriched with the casein hydrolysate and magnesium showed most consistent improvements in sleep efficiency and self-evaluated sleep quality, as compared to run-in. Despite earlier reports regarding positive effects of a low dose of tryptophan on insomnia,[3,8] our study failed to show improvements. This might be due to the fact that the tryptophan was administrated via a dairy product that is rich in protein and relatively low in carbohydrates. The latter are known to enhance tryptophan uptake in the brain. Other amino acids from dairy, such as tyrosin, affect the ratio between tryptophan and large neutral amino acids in the

blood, resulting in a not-optimal bioavailability of tryptophan in our study. Dosages of 1000mg have been associated with more consistent results.[2,8] Stressed individuals may find it difficult to fall asleep or remain asleep during the night. It was shown earlier that the casein hydrolysate used in this study has anxiolytic activity in rats, comparable to the well-known drug diazepam.[9] Human studies have shown that the casein hydrolysate had effects in reducing stress symptoms.[4,5] Recently, it was shown that the casein hydrolysate did not affect sleep in unstressed rats, but prevented sleep disturbance in stressed rats.[6] Guesdon et al. postulated that the effect was due to its anxiolytic properties, rather than a sedative effect by itself. The results from our study are in line with that, since we found no effects on sleep efficiency and sleep quality.
In the design of the study we have anticipated rapid clearance of the primary active nutrients (amino acids/peptides/magnesium) from the body and therefore chose a wash-out period of three days. However, we did not take into account the psychological aspects of the intervention as such. The positive attitude of the volunteers towards improved sleep with the milk products may have continued in the follow-up period.[3,10] By either increasing the wash-out periods or using a parallel design instead, this confounding effect may be counterbalanced. Comparing the baseline run-in period with the first treatment period gives the best indication on the short-term sleep improving effects of the treatments, when assuming absence of group effects. Treatment with the milk enriched with casein hydrolysate and magnesium appeared to significantly improve total sleep time, sleep efficiency and sleep quality, when assuming absence of group effects.

CONCLUSION

Milk improves sleep time, sleep efficiency and sleep quality in women with sleeping problems, when assuming absence of group effects in the trial results. Results for sleep efficiency and sleep quality were most consistent when the milk was enriched with a specific casein hydrolysate and magnesium.

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