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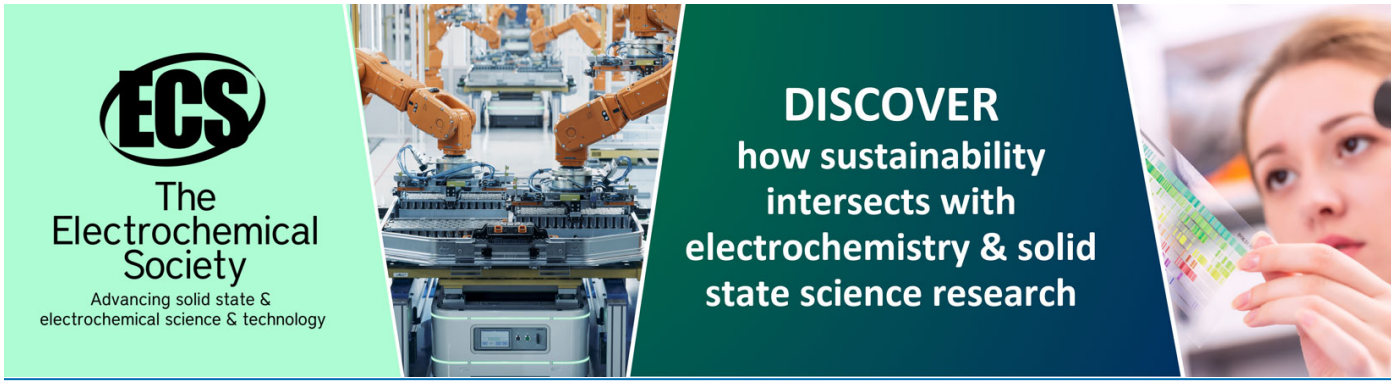

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Effect of Yogurt on Gastrointestinal Motility of Dyspepsia Mice

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Abstract. With the development of the food industry and the improvement of the living standard, people's diet structure has changed gradually. Excessive diet with high calorie and high protein could cause dyspepsia. Aim of our study is to discuss the effect of yogurt on gastrointestinal motility of dyspepsia mice. Mice were randomly divided into four groups: normal group, model group, Chinese medical group (Drug group), and yogurt group. The mice of normal group were given ordinary feed, the rest of groups were given high protein and high calorie feed and administered through gastric intubation with 52% milk solution to establish dyspeptic model from day 1 to 4. the gastric emptying rate, intestinal propulsion rate, intestinal muscle tension, small intestinal contraction frequency and motilin were measured.Compared with the normal group, the gastric emptying rate, small intestinal propulsion rate, small intestine muscle tension, the small intestine contraction frequency and the motilin concentration were decreased in the model group, Compared with the model group, the intestine muscle tension in the yogurt group was increased, the difference has statistical significance($p<0.05$), in addition, the gastric emptying rate in yogurt group was increased($p<0.05$),the small intestine contraction frequency and the motilin of yogurt group were increased.Yogurt could improve gastrointestinal motility of dyspepsia mice.

1. Introduction

With the development of the food industry and the improvement of the living standard, people's diet structure has changed gradually. Excessive diet with high calorie and high protein could cause dyspepsia. Yoghurt is fermented from fresh, non-resistant whole milk by adding lactic acid bacteria. Research showed that Lactobacillus could regulate the balance of human intestinal microflora (1) and is helpful to control adult and child diarrhea (2) and it is important to maintain physiological function of stomach and intestines. Compared with drug treatment, yoghurt as the daily drinking has advantages of yummy, abundant nutrition and convenience. The aim of this study was to investigate the effects of yogurt on gastrointestinal motility in dyspepsia mice.

2. Materials and Methods

2.1. Animal

Healthy Kunming mice, weighing 20~25g, male, were provided by the experimental animal center of Henan University of Chinese Medicine.

2.2. Experimental Materials

2.2.1. Experimental Reagents. Mouse Motilin ELISA Kit was purchased from Shanghai Yuduo Biotechnology Company Limited(N: YD3146); Yogurt was purchased from Inner Mongolia Yili Industrial Group Co., Ltd.; High fat and high calorie feed(Mixed fish floss, flour, milk powder and bean powder together according to the quality of 1: 1: 1: 2 , added water and stirred evenly, made into the same shape as the normal feed); 52% milk(Milk and water mixed in a mass ratio of 52:48); Nutritional semisolid paste(Mixed 5 g sodium carboxymethylcellulose into 125 mL of water, then added 8 g of whole milk powder, 4 g oral glucose, 4 g of soluble starch, 2 g of activated carbon, stirred evenly).

2.2.2. Experimental Instruments. Refrigerator, BL420 Biological Function Experiment System, constant temperature smooth muscle groove, enzyme-labelling measuring instrument, electrothermal constant temperature blast oven.

2.3. Animal Treatment

Mice were used to set up dyspepsia model by fed high fat and high calorie diet. Mice were grouped as follows: normal group, model group, drug group, yogurt group. The mice in normal group were fed with standard diet, and the mice in the other groups were fed with high fat and high calorie diet and given intragastric administration of 52% milk from the 1st day of experiment to the 4th day(3). Mice in yogurt group were given intragastric administration of 0.3ml yogurt/mice; and mice in drug group were given intragastric administration of 0.2 ml Jianweixiaoshi tablets solution/mice. Mice in normal group and model group were given intragastric administration of 0.2ml normal saline/mice. Five days later, the mice were sacrificed.

2.4. Observations

*2.4.1 Gastric Emptying Rate and Small Intestine Propulsion rate (4).*Mice were given intragastrically nutritional semisolid paste (self-made, sodium carboxymethyl cellulose 5 g, dissolved in 125 mL of water. Respectively, added whole milk powder 8 g, oral glucose 4 g, soluble starch 4 g, activated carbon 2 g. Stirred well, made into 150 mL of about 150 g of black semi-solid paste).20 minutes later, mice were sacrificed by cervical dislocation, the stomach was removed and weighed. The difference between the weight of the stomach and the net weight of the stomach were taken as the weight of the residual substance in the stomach. The small intestine was removed and the distance from the pylorus to the ileocecal and the pylorus to the front of the black semi-solid paste was measured.

Intestinal propulsive rate=Charcoal powder advancing distance/ Small intestine full length*100%

Gastric emptying rate=1- (Stomach full weight- Stomach weight)/ Nutritional semi-solid paste weight*100%

2. 4.2. Small Intestine Muscle Tension and Contraction Frequenc (5). 2~3 centimeter intestine was removed, then tied lines at both end of the intestine, one end fixed on the specimen hook, the other end connected tension sensor, Immersed the intestine in 37 °C desktop liquid, constantly supply of 95% O2 and 5% CO2 mixed gas into the desktop liquid. Applied 1.0 g of the preload to the intestine, balance 20 min, one hour later intestine appeared regular and stable spontaneous contraction, recorded the contraction activity curve with the BL420 biofunctional experimental system.

2.4.3. Determination of Motilin *Levels in Mice.* Motilin levels were measured according to the kit instructions.

2.5. Statistical Analysis

Data are presented as the mean ± SD. Differences were evaluated using Statistical Package for Social Science 21.0. Statistical analysis was performed using One-way ANOVA followed by least-significant difference (LSD). $p < 0.05$ was considered to be statistically significant.

3. Results

3.1. Effect of Yoghurt on Gastric Emptying Rate of Dyspepsia Mice

From Table 1, the gastric emptying rate in the model group was lower than that in the normal group (P<0.05). Compared with the model group, the gastric emptying rate in drug group and yogurt group was increased (P <0.05).

Table 1. Effect of yoghurt on gastric emptying rate in dyspepsia mice(x±s)

group	gastric emptying rate(%)
normal group	47.10±1.9
model group	34.60±1.4*
drug group	59.20±8.3*▼
yogurt group	54.60±3.1▼

Note: Compared with the normal group *P<0.05, compared with the model group ▼P<0.05.

3.2. Effect of Yoghurt on Small Intestine Propulsion of Dyspepsia Mice

From Table 2, Compared with the normal group, the model group of small intestine propulsion rate was significantly reduced (P<0.05). Compared with the model group, the small intestine propulsion rate in the yogurt group was higher than that in the model group.

Table 2. Effect of yoghurt on intestinal propulsion rate of dyspepsia mice(x±s)

group	intestinal propulsion rate(%)
normal group	49.30±5.2
model group	33.00±8.3*
drug group	41.00±1.4
yogurt group	38.80±5.6*

Note: Compared with the normal group *P<0.05, compared with the model group ▼P<0.05.

3.3. Effects of Yoghurt on Intestinal Muscle Tension in Dyspepsia Mice

From table3. Compared with the normal group, the intestinal muscle tension in the model group was decreased (P<0.05). Compared with the model group, intestinal muscle tension in the yogurt group and the drug group was increased (P <0.05).

Table 3. Effects of yoghurt on intestinal muscle tension in dyspepsia mice($\bar{x}\pm s$)

group	Intestinal muscle tension(g)
normal group	0.15±0.03
model group	0.08±0.01*
drug group	0.16±0.04▼
yogurt group	0.13±0.01▼

Note: Compared with the normal group *P<0.05, compared with the model group ▼P<0.05.

3.4. Effects of Yoghurt on Small Intestinal Contraction Frequency in Dyspepsia Mice

From Table 4, Compared with the normal group, the small intestinal contraction frequency in model group was decreased, Compared with the model group, The small intestinal contraction frequency in yogurt group and drug group was increased, and the drug group had significant statistical difference (P<0.05).

Table 4. Effects of yoghurt on the small intestinal contraction frequency in dyspepsia mice($\bar{x}\pm s$)

group	small intestinal contraction frequency (times / min)
normal group	6.31±0.64
model group	6.00±0.71
drug group	7.56±1.58▼
yogurt group	7.46±1.59

Note: compared with the model group ▼P<0.05.

3.5. Effect of Yogurt on the level of Motilin in Dyspepsia mice

From Table 5, Compared with the normal group, the level of motilin in the model group was decreased (P<0.05). Compared with the model group, the level of motilin in yogurt group and drug group was increased.

Table 5. Effect of Yogurt on the level of Motilin in dyspepsia mice($\bar{x}\pm s$)

group	the level of Motilin(ng/L)
normal group	2002.68±374.14
model group	1101.77±275.75*
drug group	1221.19±392.92
yogurt group	1105.56±271.11

Note: Compared with the normal group *P<0.05

4. Discussion

Gastric emptying refers to the process of chyme from the stomach into the duodenum, is a comprehensive manifestation of gastric motility, and delayed gastric emptying is the main manifestation of gastrointestinal motility disorders (6). During the experiments, mice were fed high-calorie high-protein foods to establish the model of dyspepsia. Excessive consumption of high-calorie high-protein foods is prone to reduce the transportation of stomach and inhibit the movement of gastrointestinal motility. The gastric emptying rate of mice in yogurt group and drug group was higher than that in the model group, which indicated that yogurt and Jianwei Xiaoshi Tablets have a positive effect and can effectively promote gastric emptying function.

Small intestinal propulsive rate, is one of the classical indexes of gastrointestinal mechanical movement, it can effectively reflect the gastrointestinal peristalsis. Clinically, the main pathophysiological basis of gastrointestinal motility disorders is gastric emptying delay and peristalsis slowing (7).According to the experimental results, the small intestine propulsion of mice in yogurt group and drug group was higher than that in the model group, which indicated yogurt and Jianwei Xiaoshi Tablets improved gastrointestinal peristalsis function.

The main function of gastrointestinal smooth muscle was regulating gastrointestinal movement. Lots of gastrointestinal diseases were also accompanied by muscle contraction function abnormal, which lead to gastrointestinal motility disorder (8).The experimental results showed that the small intestine muscle tension in mice of the yogurt group and the drug group was higher than that of the model group, which indicated that the yogurt and the drug could enhance the small intestine muscle tension of dyspepsia mice.

Motilin could stimulate gastrointestinal mechanical movement and physiological electrical activity, especially, it has an important role in the regulation of the migrating motor complex (MMC)-phase III of the gastrointestinal tract in interdigestive state (9).The experimental results showed that the yoghurt groups and drug groups was higher than that in the model group, indicated that both yogurt and JianweiXiaoshi tablet could promote the peristalsis of the gastrointestinal tract.

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