

# The Cause Gastrointestinal Motility Dysfunction and Its Mechanism

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**Abstract.** Previous studies have shown that: the incidence of a wide range of gastrointestinal motility disorders, high frequency, have seriously affected the recovery of athletes training and after training. This article from a variety of factors that affect gastrointestinal function point of view, its comprehensive study, and with the traditional Chinese medicine theory to combine, understand why sports gastrointestinal dysfunction occurs in many ways, influencing factors and possible mechanisms for the early treatment of exercise-induced gastrointestinal syndrome lay a theoretical basis, to provide a theoretical reference for the normal exercise training.

In the sports training process, athletes often gastrointestinal motility disorders occur. Numerous studies show that the incidence of a wide range of gastrointestinal motility disorders, high frequency, has become a more prominent issue affecting normal athlete training and competition. Some people have the disease causes and influencing factors were the incidence of some phase epidemiological survey, the majority of research has focused on aspects of exercise-induced gastrointestinal syndrome incidence survey, description and characterization of symptoms and hazards, for the exact mechanism of its occurrence is still not very clear. High-intensity exercise for the body to produce strong stress, so that the structure and function of the gastrointestinal tract produce changes [1]. Causing movement of the moving gastrointestinal disorders, and even stomach ulcers occur.

This article from the gastrointestinal itself changes, neuroendocrine changes, radical aspects of a comprehensive review of research, combined with traditional Chinese medicine theory, to fully understand the reasons sports movement occurring gastrointestinal disorders, and may the mechanism for the early prevention of movement of the moving gastrointestinal disorders theoretical basis.

## 1 Research Status gastrointestinal motility dysfunction

### 1.1 Types

Depending on the site of the occurrence can be divided into upper and lower gastrointestinal digestive gastrointestinal disorders are two types of gastrointestinal disorders. On exercise-induced gastrointestinal disorders gastrointestinal clinical features are: stomach pains after sports and exercise, vomiting of coffee-like material, the next day it appears black; most athletes can not find the cause and location of gastrointestinal bleeding; a few players performance is delayed hemorrhage - black stools; most people previously healthy, has not been seen vomiting, melena and other medical history, especially occurs in Exhaustive endurance sports. Under gastrointestinal disorders mainly for diarrhea, it is intended, blood in the stool and other symptoms. During exercise demonstrated symptoms are not the same form, analyze the causes and factors which may form of exercise, exercise duration, exercise intensity, age, gender, training status, diet and so on.

### 1.2 Relationship with sports

According to reports, there are differences in the incidence of sports projects gastrointestinal disorders. Harry et al[2] for 450 long-distance running, cycling and triathlon athlete survey about the volume occurs in sports training and competition gastrointestinal disorders show: cyclists have 67%, 76% of long-distance runners, triathlon Athletes appear less than long-distance runners. AMO' Connor et al[3] 26 Mingmalasong athletes conducted a survey showed that 31 percent of the athletes gastrointestinal disorders. American scholar Steve[4] investigated the 319 athletes, sports involved are skating, skiing and other projects, research results are consistent with the Harry et al.

Difference of possible causes are many, but the sports biomechanics point of view, may be related to the human body in different types of sports related to the difference in acceleration.

The incidence of gastrointestinal disorders and the nature of the exercise intensity and exercise duration and exercise also have a certain relationship. Generally, the greater the exercise intensity, the longer the duration, the probability of causing gastrointestinal dysfunction on the large, Sotfer[5] studies have shown that low-intensity sports generally do not produce gastrointestinal disturbances, when exercise intensity reaches 90% V<sub>O2</sub>max, only gastrointestinal disorders. Another study showed that in the long-distance running, even small intensity, continuous movement over two hours, there will be gastrointestinal disorders[6].

### 1.3 Relationship between gender and age

According to the research report, gastrointestinal motility disorders woman higher incidence than men, which may be physiological characteristics, such as hormones, the menstrual cycle and other factors. Another study found that younger than older athletes are more vulnerable, gastrointestinal disorders and athletes showed gender and age have a certain relationship[7]. In addition, studies also show that diet and exercise prior to the occurrence of gastrointestinal disorders also have a certain relationship, such as the nature of the food, eating time and sports drinks and other supplements, which is caused by a number of factors that can not be ignored gastrointestinal disorders.

## 2 The Cause gastrointestinal motility dysfunction

China reported on the pathogenesis of exercise-induced gastrointestinal disorders is less, the majority of foreign literature is limited to speculation and hypothesis. But long-term research and discussion, confirmed that it was a non-specific biological organism defense response to various stress stimuli, is multiple organs of the central nervous, endocrine and immune systems such interaction leads to mucosal protective mechanisms weaken, damage factors relative enhancement effect[8]. That is the overall factors such as neuro-endocrine disorders, but also with local factors such as gastric mucosal barrier protection to weaken and damage relative enhancement factors related to the comprehensive result of multiple factors.

### 2.1 Gastric mucosal blood flow, gastrointestinal hormone secretion and gastric acid change

Provide blood to the stomach tissue of oxygen and nutrients to the gastric mucosa, and also transport bicarbonate, discharge of hydrogen ions and is involved in cell protection. If the gastric mucosal blood flow reduction will affect the defense capabilities and weaken the function of the gastrointestinal tract.

In the case of blood occurs exercise stress redistribution result makes a lot of blood flow in skeletal muscle, gastric mucosal blood flow drastically reduced; in addition exercise stress due to hyperactivity of the stomach, mucosal folds oppression blood vessels, so that the relative lack of blood oxygen, resulting in reduction of energy supply, reduce resistance to damage the ability of the stomach, causing mucosal epithelium local necrosis, bleeding gastric mucosal blood flow decreased now that is a major cause leading to gastrointestinal disorders.

Acid is a partial factor strongest attack, literature shows that exercise does not increase gastric acid secretion, is now more clear, there is a certain amount of hydrochloric acid in the stomach is necessary for the occurrence of stress ulcer, and in the event of ulcers, gastric acid aggravate presence can play a role, but the acid is not the main reason for stress ulcer. Exercise Stress condition, adrenal hormones can promote gastric acid secretion, inhibit the secretion of gastric mucus, thereby promoting the occurrence of gastrointestinal disorders.

Regulate gastrointestinal hormone secretion of the digestive tract, sports, absorption, blood flow and cellular nutrition and other functions, it is bound to affect their secretion of gastrointestinal function[9]. When the stress, the sympathetic - adrenal system excitability, release of adrenaline and noradrenaline can cause lasting sympathetic excitement, so that the supply of small mucosal spastic contraction of blood vessels, gastrointestinal ischemia; when stress, hypothalamic - pituitary - thyroid axis of excitability, thyroid hormone can increase the metabolic rate of gastric mucosal cells, the energy metabolism of gastric mucosa caused by ischemia and hypoxia exacerbated under stress.

Study confirmed[10] winter swimming can improve the function of the human microcirculation, can remove or reduce the negative factors within the blood vessels, prevent the occurrence of gastrointestinal disorders. In recent years, we found that certain neuropeptides during stress center (such as substance P, enkephalin) are also involved in the regulation of stress process.

## 2.2 Gastrointestinal architecture mechanical shock and gastrointestinal flora area Change

The incidence of gastrointestinal motility disturbances in long-distance movement is about twice of other projects, but mostly lower gastrointestinal symptoms, which may be related to long-distance running during gastrointestinal abdominal region by a greater degree of mechanical vibration on [11]. Whether such gastrointestinal vibrations through what mechanisms affect the gastrointestinal functional status, is not yet very clear.

Gastrointestinal microorganisms play an important role in maintaining human health, and the occurrence and gastrointestinal disorders are closely linked. Using DNA fingerprinting technology to change the intestinal microbial community structure athletes were continuously detected[12], suggesting that in middle and long distance athletes, some athletes intestinal flora structure is relatively stable, the exercise load affected by small changes, and some athletes opposite. Presumably, a stable microbial community structure may be one to keep the body healthy and stable at the large amount of time or dramatic changes in the environment plays an important condition for athletic performance.

## 2.3 Radicals

Free radicals oxidative damage has become an important reason sports injury occurred. Some studies have shown[13], the stomach tissue exhaustive swimming rats MDA, free thiols and ATP content instantly no significant change in the movement, but the movement of a significant increase in 30min and 60minMDA content, and free thiols and ATP content was significantly decline, while morphology show, 30min and 60min severe stomach tissue damage after exhaustive swimming, which showed an increase in exercise-induced free radicals is one of the causes exercise-induced gastrointestinal dysfunction.

## 2.4 Neurotransmitters and nerve - endocrine - immune system function changes

Davision[14] confirmed that not only controls the acetylcholine secretion of gastric juice and gastric mucosa, but also controls the release of antral mucosa gastrin. Gastrin effect of acid secretion through the release of Ach be adjusted. Nitric oxide is the gastrointestinal tract of a non-cholinergic neurotransmitter, both second messenger function, regulate gastrointestinal mucosa in the digestive system and maintaining mucosal blood flow and capillary barrier integrity an important role, while also involved in the regulation of gastric acid secretion, gastrointestinal ulcers and also the amount of nitric oxide abnormalities. The motion gastrointestinal disorders occur with how nitric oxide, still no common understanding.

In the course of strenuous exercise, to strengthen the sympathetic activity, parasympathetic excitability decreased, inhibited the gastrointestinal gland secretion. But it was also found in animal experiments, the motion did not have a significant effect on the gastrointestinal tract gland secretion[15]. About a dozen gastrointestinal hormones, which together with the nervous system regulating movement of the gastrointestinal tract, secretion and absorption of other activities. Connor found[16], many of the functions related to gastrointestinal gastrointestinal hormones in motion will change, thereby reducing the gastrointestinal absorption of body fluids and nutrients, leading to dehydration and lack of energy storage, causing some athletes gastrointestinal disorders occur. Under stress neuroendocrine disorders involving the central nervous and neuropeptides, pathways, neurotransmitter release, receptors and other issues. The relationship among lose balance will lead to the loss of immune function, especially in people who engage in sports, will increase the interaction between mucosal antigen during strenuous exercise. Above the central nervous system and the neuropeptide primarily by the autonomic nervous system and the pituitary - adrenal axis on target organs - the stomach, causing gastrointestinal membrane pathophysiology, time can lead to severe exercise stress gastric ulcer occurrence.

## 2.5 Chinese medicine

Chinese medicine believes that the human spleen is acquired, its function Qi, the Blood, main

transport, the main muscles. The overtrained athletes appear Shenpi lack, loss of appetite, anemia, and many other symptoms. There are many similarities and Chinese medicine spleen qi deficiency, modern medical research showed that the main and the body to digest the spleen, blood, immune, and other functions related to thermoregulation, exercise stress occur gastrointestinal dysfunction, decreased ability to absorb nutrients and immunity dysfunction is a common phenomenon, which affects the absorption of nutrients, namely gastrointestinal disorders.

### 3 Prospects

From the current situation of research at home and abroad, the majority of research on disorders of the gastrointestinal tract of animals is still based, and for animal modeling and experimental methods and training than the actual situation there is still a big difference; in the etiology of research, Most of tissue and organ level, few studies the molecular level.

In summary, in recent years, studies on gastrointestinal motility disorders aspect made significant progress, but a lot of research just a few indicators of observation, analysis of the links between indicators is not enough. There are many factors in gastric mucosal injury, and to "bio - psycho - social" medical model from a simple and "biological" model comprehensive paradigm shift, psychological, emotional, and some other social factors Syndrome in gastrointestinal motility Mechanism of action more and more attention. Therefore, the study of gastrointestinal motility disorders in how to combine physiological and psychological, individual and social organically. However, animal studies to establish the incidence of emotional models more difficult, in animal models of emotional and gastric mucosal injury pathogenic is still in the exploratory stage, so to solve this problem also requires constant effort. In recent years, Chinese medicine to protect the gastric mucosa related research has made substantial progress, which at the same time fulfilling the traditional Chinese medicine theory, it provides a theoretical basis for the interpretation of medical treatment gastric disease, others develop mucosal protective agent specified the way forward.

### References

- [1] Peters HP, Bos M, Scebrechts L, et al. Gastrointestinal symptoms in long-distance runner, cyclists and triathletes. *Am.J.Gastrointestinal*. 1994;1570-1581.
- [2] Harry MD. Don't miss gastrointestinal disorders in athletes, *J.Sports Med*, 1997,25(11):180-190.
- [3] Connor AM, Johnston CF, Buchanan KD, et al. Circulating gastrointestinal hormone changes in marathon running. *J.Sport Med*. 1995,16:283-287.
- [4] Steve C, Carrio I, Estorch M, et al. Gastric emptying in marathon runners. *Gut*, 1989,30:152-155.
- [5] Softer EE, Merchant RK, Duethman G, et al, Effect of graded exercise on esophageal motility and gastro esophageal reflux in trained athletes, *J.NX Med J*, 1993, 38(12): 220-224.
- [6] Clausen JP. Effect of physical training on cardiovascular adjustments to exercise in Man. *Physiol. Rev*. 1989,57:779-815.
- [7] Leitzmann MF, Rimm EB, Willett WC, et al. Recreational physical activity and the risk of Cholecystectomy in women, *N.Engl.Med*. 1999,341:777-784.
- [8] Brouns F, Beckers E, Brouns F, et al. Exercise and training effects on gastric emptying of Carbohydrate beverages. *Med.Sci.Sports Exerc*. 1990,21:540-549.
- [9] Rawdon BB, Andrew A. Origin and differentiation of gut endocrine cells. *Histol Histopathol*, 1993, 8(3):567-580.
- [10] Bombeck CT. Sojick. Gabrys SF. Antral reactivity: Effect of vagal innervation on antralgastrin release by various stimuli. *American Journal of Surgery*. 1974.127; 76.
- [11] Green MD. Gastrointestinal disorders in the athletes. *Sports Med*, 1992,11:453-470.

- [12] Connor AM,Johnston CF,Buchanan KD,etal.Circulating gastrointestinal hormone changes in marath on running.Int J Sports Med,1995,16:283-287.
- [13] Konturek SJ,Tasler J,Obtulowicz W.Effect of exercise on gastrointestinal secretions.Appl Physiol, 1989,34:324-328.
- [14] Davision JS. Fahrner PC. schofield B. The role of the parietal cell of gastrinderivatves. Canadian journal of physiology and phamacology.1974.52; 469.
- [15] Konturek SJ,Tasler J,Obtulowicz W.Effect of exercise on gastrointestinal secretions.Appl Physiol, 1989,34:324-328.
- [16] Connor AM,Johnston CF,Buchanan KD,etal.Circulating gastrointestinal hormone changes in marath on running.Int J Sports Med,1995,16:283-287.