

# Intestinal acariasis in Anhui Province

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**Subject headings** mite infestation; intestinal diseases, parasitic; epidemiology; data collection; tick control; leukocytes count

Li CP, Wang J. Intestinal acariasis in Anhui Province. *World J Gastroentero*, 2000;6(4):597-600

## INTRODUCTION

The mites found in stored food and house comprise a large group of subclass Acari, belonging to the suborder Acaridida of the order Acariformes. They can be found in dust and vacuum samples from floors, furniture, mattresses, Chinese herbal medicine, dry fruit, grain, flour, sugar, and bedding. These mites are nidicolous and feed on organic debris, including sloughed human skin, fungi, spilled food, pollen, etc. These mites are particularly prevalent in Chinese herbal medicine, dry fruit, grain, flour, sugar, beds, though carpeted floors near beds or couches may also have large numbers. The most common species are *Acarus siro*, *Tyrophagus putrescentiae*, *Dermatophagoides farinae*, *D. pteronyssinus*, *Glycyphagus domesticus*, *G. Ornatus*, *Carpoglyphus lactis* and *Tarsonemus granarius*, etc. The viability of mites in storage is quite strong and they can invade and parasitize the intestines of humans<sup>[1-15]</sup>. They can cause pulmonary acariasis<sup>[16-25]</sup>, urinary acariasis<sup>[26-33]</sup> and so on. The dejecta of mites is a quite strong allergen and can cause different allergic diseases<sup>[34-44]</sup>. Intestinal acariasis can be caused by some mites related to the way of diet intake and invading against intestinal mucosa, intestinal muscle<sup>[45-58]</sup>. The first report of intestinal acariasis caused by these mites was made by Hinman *et al* (1934)<sup>[45]</sup>. From then on, all kinds of studies on the disease have been reported gradually. In order to make an epidemiological survey of intestinal acariasis the investigation of the disease was taken in some areas of Anhui Province from 1989 to 1996.

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**Supported by the grants from Science Foundation of the Ministry of Coal Industry of China**

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Received 2000-01-23 Accepted 2000-02-15

## MATERIALS AND METHODS

### Materials

The site of investigation was in the Chinese traditional medicine storehouses, factories and rice storehouses, rice mills, primary schools and so on, the subjects of investigation were sellers of the traditional Chinese medicine, workers of granary and processing, primary school pupils in grades 1-6 and 152 patients with diarrhea who sought medical advice and workers in certain processing factories.

### Methods

**Case history** Included the history of present illnesses, the history of past illnesses, the patients' occupation.

**Feces examination** First, the stool of the subject was collected in disposable feces boxes. Secondly, mites were separated by saturated saline flotation methods and identified with the help of microscope.

**Blood examination** Differential leukocyte counting was made in patients who had positive results of feces mite examination.

## RESULTS

### The rate of detection of mites in stool and clinical symptoms

The total number of samples of feces examination were 3416 (male 1879, female 1537), the positive number of mites in stool were 225 (male 128, female 97) and the detectable rate of mite was 6.59% (male 6.81%, female 6.31%). Among them, the samples of feces examined in the groups of age 5-14, 15-24, and >24 were 1829 (5.74%), 508 (3.54%), 927 (6.36%) respectively. There were 43 positive samples in 152 patients with diarrhea who were suspected to suffer from intestinal acariasis, the detectable rate was 28.29%. Of the 225 mite positive cases observed after stool examination, the detectable number of mite cases together with other intestinal parasites was 131, the number of cases with only mite symptoms was 94.

Results of analysis of digestive canal symptoms in 30 cases positive of mites all one in stool showed that the number of patients with diarrhea, abdominal pain, abdomen discomfort, mucous stool, pus and blood stool, burning sensation of anus were 26 (86.67%), 20 (66.67%), 19 (63.33%), 15 (50.00%), 13 (43.33%), and 14 (46.67%) respectively. Besides, some of the patients were accompanied with the symptoms of hypodynamia, magersucht, lassitude, asthma, vomiting, anorexia, low fever, dysphoria, general

malaise, etc.

### Mites separated from stool

The detectable rates of adult mites, larval mites, both adult and larval mites, both adult mites and eggs, adult and larval mites and eggs, both larval mites and eggs, and both hypopus and eggs were 44.00% (99), 10.22% (23), 34.67% (78), 2.67% (6), 4.89% (11), 2.22% (5), and 1.33% (3) respectively. The population identification analysis showed that there were *Acarus siro*, *Tyrophagus putrescentiae*, *Dermatophagoides farinae*, *D. pteronyssinus*, *Glycyphagus domesticus*, *G. Ornatus*, *Carpoglyphus lactis* and *Tarsonemus granarius* in stool. Furthermore, the hypopus of mites could be found. The statistics of this investigation showed that the concentration of mites with a count of 1-2/cm<sup>3</sup>, 2-4/cm<sup>3</sup>, >5/cm<sup>3</sup> was 11, 55, 159 respectively.

### Blood examination

Among the 30 patients, differential leukocyte count in most cases was  $(5.55-10.4) \times 10^9/L$  with the exception of 4 cases  $[(11.0-12.9) \times 10^9/L]$ . The eosinophilic granulocyte count was high  $[(0.32-0.78) \times 10^9/L]$ . The average value of constituent ratio of eosinophilic granulocyte was 0.09 (0.04-0.11) and was higher than that of normal control ( $P < 0.01$ ).

### The rate of detection in different occupations

The field investigation showed that different rate of invasion existed in different occupations. The detectable rates of mites in stool were 6.71% (20/298), 6.59% (89/1350), 6.14% (98/1596), 4.17% (5/120) and 25.00% (13/52) in herb stuff processors and sellers, food storage and processor workers, primary school pupils, machinery workers, and some others.

### Anamnesis

Among the 30 patients with obvious symptoms, the total misdiagnosis rate was 63.33%. The patients who had been misdiagnosed for chronic colitis, allergic enteritis, intestinal neurosis, amebiasis, hookworm disease, ascariasis, chronic appendicitis, pelvic inflammation, metroendometritis, intestinal adhesion, and chronic diarrhea were 2, 5, 3, 1, 1, 1, 2, 1, 1, 1, and 1 respectively.

### Mites separated from work environment

Different breeding mites were separated from the samples of work environment and food. Collecting the samples of mill floor dust (30 shares), stores of traditional Chinese medicine, and traditional Chinese herbs (146 species) of wolfberry fruit, ophiopogon root, liquorice, boat-fruited sterculia seed, safflower, and so on. The results showed that the number of breeding mites per gram were 91-1862, 21-186, 0-483, 10-348, 51-712, and 311-1192, in mill floor dust, traditional Chinese medicine stores, traditional Chinese herbs such as candied fruit, dry

fruit, brown sugar, and expired cake. Twenty-six species of mites could be identified out of them (most of them were unidentifiable), and belonged to nine families of Acaridae, *Carpoglyphidae*, *Glycyphagidae*, *Pyroglyphidae*, *Histiostomidae*, *Chortoglyphidae*, *Lardoglyphidae*, *Tarsonemoidae* and *Cheyletidae*. The results of this study showed that the mites separated from work environment were identical to those from stored food.

### DISCUSSION

The main pathogenic mites have been verified as *Acarus* and *Tarsonemidae* by Zuo Zuoxue (1951). However, most of the mites causing intestinal acariasis that have been confirmed by Li Yousong (1980), Zhou Hongfu (1986), Li Chaopin (1987)<sup>[56]</sup> *et al*, belong to 6 families Astigmatid order like, *Acaridae*, *Carpoglyphidae*, *Glycyphagidae*, *Pyroglyphidae*, and *Tarsonemidae*. The results of our investigation are in basic agreement with the views that had been previously reported. With regard to the path of infection of intestinal acariasis, the general idea was that the infection of the disease was caused by the mites coming from stored and swallowed food<sup>[50-58]</sup>. Our study has verified that mites separated from stool were identical to those from storage, and belonged to common species of mites in our living environment and stored food. With the help of dust sampler, eight sampling sites were set up in a traditional Chinese medicine plant. Thirteen mites (adult 9, larval 4) were separated from the 640 L volume of air in the work environment of the plant. Thus another path of infection may be through respiration and swallowing of the mites in the air. The results of our study also showed that intestinal acariasis was associated with the hobby of drinking of tea, including ophiopogon root, liquorice, boat-fruited sterculia seed; and eating dry fruit, including da teplum persimmon, preserved fruit, candied fruit, dried persimmon, and even dried flesh of fish. Previous reports<sup>[45-58]</sup> and the conclusions of this study verify that the disease is associated with breeding of mites in the diet, work environment, and stored food; but unassociated with age or sex.

The vitality of some mites causing intestinal acariasis is quite strong. The study report of Kodama *et al*<sup>[48]</sup> had confirmed that the mites could live in 10% formalin for 12 days and then oviposit after two weeks, they could live in stool for 83 days and then oviposit and hatch to larva. In our study, twenty mites were soaked in distilled water at the temperature of 20-25°C, and another twenty in running water at room temperature for 7 weeks. The results showed that the mites collected from the bottom of the test tubes were all alive. After the stool with *Acarus siro* had been stored in a sealed plastic bag for 7 weeks, active mites could still be found. Kampmeier's report verified that not all mites could be killed by gastric acid or digestive juices<sup>[49]</sup>. Mites could be found alive by differential leukocyte count.

After mites came into the intestinal tract, mechanical stimulation and injuries of tissues were caused by the

gnathosoma, chelicera, feet, and so on<sup>[59]</sup>. The dejecta, products of metabolism, and cleaved body parts of mites could cause different allergic reactions of the digestive system, such as abdominal pain, diarrhea, burning sensation of anus, and so on. The reports in past have shown that the dejecta, metabolites, cleaved body parts were all quite strong allergens and could result in high levels of eosinophilic granulocytes, total IgE, special IgE for mites in serum. The clinical manifestation of this was allergic urticaria, allergic rhinitis, allergic asthma et al<sup>[34-44]</sup>. The results of our studies showed that the levels of eosinophilic granulocytes in patients with intestinal acariasis were high too. Its possible mechanism could be similar to that of the allergic reaction caused by other mites. The intestinal acariasis may not only cause injury of the intestinal mucosa and invade the intestinal muscle but also stimulate the immune system by the dejecta, metabolites, and cleaved body of the mite itself. The disease may be easily misdiagnosed for allergic enteritis, chronic colitis, intestinal neurosis, amebiasis, pelvic inflammation, or schistosomiasis japonica<sup>[60]</sup>. As a result, proper treatment might be thus delayed.

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Edited by Zhou XH  
proofread by Mittra S