



Review Article

# A Review of the Importance of Stool Test in the Diagnosis of Intestinal Parasites

Yagoob Garedaghi<sup>1\*</sup>

<sup>1</sup>Department of Parasitology, Tabriz Branch, Islamic Azad University, Tabriz, Iran

## Abstract

**Objectives:** Stool test is a test used to diagnose an infection or intestinal parasitic infection. Gastrointestinal infections occur for a variety of reasons, so this test is valuable along with other complementary tests. Common gastrointestinal infections are commonly reported as food poisoning or stomach infections. However, diagnostic tests are useful for treating and removing the source of the disease.

**Methods:** This study was reviewed by using a search of keywords including, “stool test”, “Diagnosis”, “Intestinal Parasites”, in Google Scholar, PubMed, and Elsevier databases. Approximately 15 articles were selected that were examined thoroughly.

**Results:** The results of our study revealed that the direct microscopic method is more widely used in medical diagnostic laboratories due to its time saving and simplicity of testing.

**Conclusion:** Stool tests are recommended for people with symptoms of a gastrointestinal infection. These symptoms include: Prolonged diarrhea, abdominal pain (cramping), nausea and vomiting, Stools with blood and mucus. However, diagnostic tests are useful for treating and removing the source of the disease.

**Keywords:** Stool test, Diagnosis, Intestinal parasites.

Received: September 30, 2019, Accepted: February 28, 2020, ePublished: April 1, 2020

## Introduction

Intestinal parasites are considered health problems in many countries, especially in developing countries. One of the important indicators of health and well-being of any society is the status of people in that society with parasitic infections (1,2). Infection with these parasites is one of the problems and obstacles to economic and social development in most countries of the world and despite the continuous efforts and extensive planning of the World Health Organization, they are still one of the main health problems in developing countries. According to the World Health Organization, the rate of infection with these agents in the world is estimated to be 3.5 billion people, which leads to 4.5 million cases of clinical symptoms. Infection may be asymptomatic or can lead to disability and eventually death, depending on the nutritional status, health, and socioeconomic status of patients (3,4).

Factors influencing the spread of parasitic infections in developing countries include low levels of public awareness, poor nutritional status in terms of quantity and quality, climate diversity, and uncontrolled population growth. Intestinal parasitic diseases are among the most important infectious diseases that are directly related to personal and public health (5). Because intestinal parasitic infections are usually chronic, an infected person may be

asymptomatic for a long time and transmit the infection to the community. Severe gastrointestinal symptoms and disorders may also develop over time. Infection with these parasites leads to malnutrition, insufficient physical growth, anemia, and reduced learning, especially in children. Water, vegetables, and food are the most important sources of these infections (6).

Today, due to the diversity of climate, type of work and life of people, the use of animal and human fertilizers in plant breeding, the inclusion of raw vegetables in the diet, and epidemiological, cultural, and economic criteria, there are a great variety of parasites in the world (7).

In order to control these infections, proper health services such as determining the prevalence, formulating policies, controlling and evaluating the operations performed should be provided, and considering the pathogenic role of parasites in causing physical, psychological, economic, and social problems, the fight against parasites is of great importance (8). Medical professionals are among the high-risk groups in terms of infection with these infectious agents.

A stool test is a test used to diagnose an infection or intestinal parasitic infection. Gastrointestinal infections occur for a variety of reasons; therefore, this test is valuable along with other complementary tests. Common gastrointestinal infections are commonly reported as food



\*Corresponding Author: Yagoob Garedaghi, Email: Yagoob.garedaghi@gmail.com, Y\_garedaghi@iaut.ac.ir

poisoning or stomach infections. However, diagnostic tests are useful for treating the disease and removing the source of the disease (9).

*Entamoeba histolytica* and *Giardia lamblia* are two of the most common pathogenic protozoa worldwide. Proper diagnosis of infection will be critical for the management of these diseases and prevention of new cases. Parasites that are detected in the feces of immunocompromised individuals such as those with AIDS include *Cryptosporidium*, *Microsporidia*, *E. histolytica*, *G. lamblia*, *Isospora belli*, and *Strongyloides stercoralis*. Amoebic cysts, *Giardia* cysts, and worm eggs can be obtained from solid stools, while trophozoites are often found in loose or watery stools (10). The observation of erythrophagocytic trophozoites in bloody mucoid stools is a good evidence for invasive amoebiasis. In these cases, smear stained with trichrome or iron hematoxylin confirms the presence of *E. histolytica*, which is detected in only 50% of biopsy specimens. In patients with amoebic liver abscess, the amoeba are not always present in the stool and serological tests are more reliable in these patients (11).

#### Reason for Requesting a Stool Test

Stool tests are recommended for people with symptoms of a gastrointestinal infection. These symptoms include prolonged diarrhea, abdominal pain (cramps), nausea and vomiting, stools with blood and mucus. These symptoms usually improve in people with a healthy immune system with personal care, but a stool test may be needed in the following cases: 1) disturbance of water and electrolytes or severe gastrointestinal complications due to prolonged diarrhea, 2) symptoms of gastrointestinal infection in children, the elderly, or people with weakened immune systems, 3) existence of symptoms of gastrointestinal infection for a long time without improvement, and 4) people exposed to direct contact with parasitic infections.

#### Stool Sampling

1. The sample should be delivered to the laboratory within 30 minutes to one hour and examined. Direct examination of motile trophozoites can only be performed on fresh specimens.
2. Watery or loose stools that cannot be delivered to the laboratory within one hour should be preserved. Polyvinyl alcohol protects the protozoan trophozoites. Solid stools may be stored in formalin or refrigerated until delivery to the laboratory.
3. Because the presence of parasites in the stool is variable and may be intermittent, in cases of strong clinical suspicion, multiple samples should be taken over 7 to 10 days.
4. For *Trichomonas vaginalis*, fresh urine should be delivered to the laboratory within one hour without refrigeration.
5. For *Schistosoma haematobium*, the urinary sediment may contain multiple eggs trapped in the mucus. The

peak of egg-laying is between noon and 3 pm.

6. To collect the sample, a clean dry wide-mouthed plastic container for stool and a sterile plastic container for urine should be selected.
7. Immediately after sampling, transfer the sample to the microbiology section for analysis in less than 1 hour. Unstable samples should be taken immediately.
8. If sampling is done outside the laboratory, the sample should be sent to the laboratory within 15 minutes.
9. The place, time, and date of sampling should be recorded on the test sheet.
10. Keep notes of the patient's history of travel to endemic areas, clinical diagnosis, or suspected parasitic infection. It is important to know the patient's use of contaminated water and food.

#### Additional Information About Stool Tests

*Giardia lamblia* and *E. histolytica* are two of the most common intestinal protozoan parasites worldwide. The symptoms caused by intestinal pathogenic protozoa are similar (such as diarrhea, abdominal pain, and nausea) and are neither specific nor diagnostic. In addition, clinical symptoms vary depending on the type of protozoan infection and the patient's immune status. Definitive diagnosis of intestinal protozoan infections depends on microscopic examination of fecal samples (12).

#### Best Ways to Do a Stool Test

##### Concentration Method

Concentration method increases the chances of detecting a small number of parasites by removing additional materials. This method is divided into two techniques of flotation and sedimentation.

In the flotation technique, higher density solutions are added to the fecal suspension rather than living organisms. These solutions precipitate excess fecal matter and cause the parasites to float on the surface of the liquid. One of the disadvantages of this method is that some cysts and eggs do not float and their walls are destroyed.

In the sedimentation technique, solutions with a higher density than living organisms are added to the fecal suspension. These solutions increase the concentration of the parasite in the sediment from the centrifuge. The presence of additional materials in parasitic sediment is one of the disadvantages of this method.

##### Direct Microscopic Method

In this method, a certain amount of stool is mixed with a drop of physiological serum on a clean slide. The movement of live trophozoites inside the suspension can be seen under a microscope with a  $\times 40$  lens. In this method, a certain amount of stool is mixed with a drop of Lugol's iodine on a clean slide. Iodine solution stains the internal structures of parasites and cysts, which improves diagnostic power. The direct microscopic method is more

widely used in medical diagnostic laboratories due to its speed and simplicity of testing (13).

### Limitations and Interfering Factors in Fecal Testing

A negative result will not rule out the possibility of parasitic infection. *Entamoeba dispar* and *Entamoeba moskovskii* are morphologically similar to *E. histolytica* but they are non-pathogenic and non-invasive. In *Giardia* infection, in the early stages of the disease, patients who periodically excrete the organism in the feces, and in chronic cases of the disease, a fecal test may be negative. The sensitivity of microscopic methods for detecting *Giardia* is 46-95%. Artifacts should be kept in mind when examining feces (Figure 1).

### Description of Stool Test

In cases of suspected *Oxyuris vermicularis* (*Enterobius vermicularis*), in addition to feces, a sample taken with Scotch glue should also be used. Urine samples may be needed in the middle of the day to detect certain parasites. *Trichomonas vaginalis*, *Schistosoma hematoma*, *Entamoeba histolytica*, and *Oxyuris vermicularis* eggs may be seen in the urine. Geographical location and

travel history will be helpful in considering potential interference (14).

### What is a Stool Culture Test?

In stool culture, laboratory staff identify the bacteria that live in the stool. They put a sample of the stool on special plates. These plates contain a gel that acts as a growth medium and promotes the growth of bacteria. Laboratory staff will then try to identify the bacteria by staining, microscopic analysis, and other tests. For example, laboratory staff may look for the following bacteria in the stool: *Campylobacter*, *Salmonella*, and *Shigella* species (15).

Stool tests for harmful organisms can help doctor identify the cause of the symptoms. Stool cultures can help them identify the type of harmful bacteria and treatments that may be effective. If harmful bacteria are found in the stool, the doctor may prescribe antibiotics or other medications. If no dangerous bacteria are found, the symptoms may be due to other causes. The doctor may do more follow-up tests. For example, he/she may look for symptoms of irritable bowel syndrome, parasitic infection, or other problems.

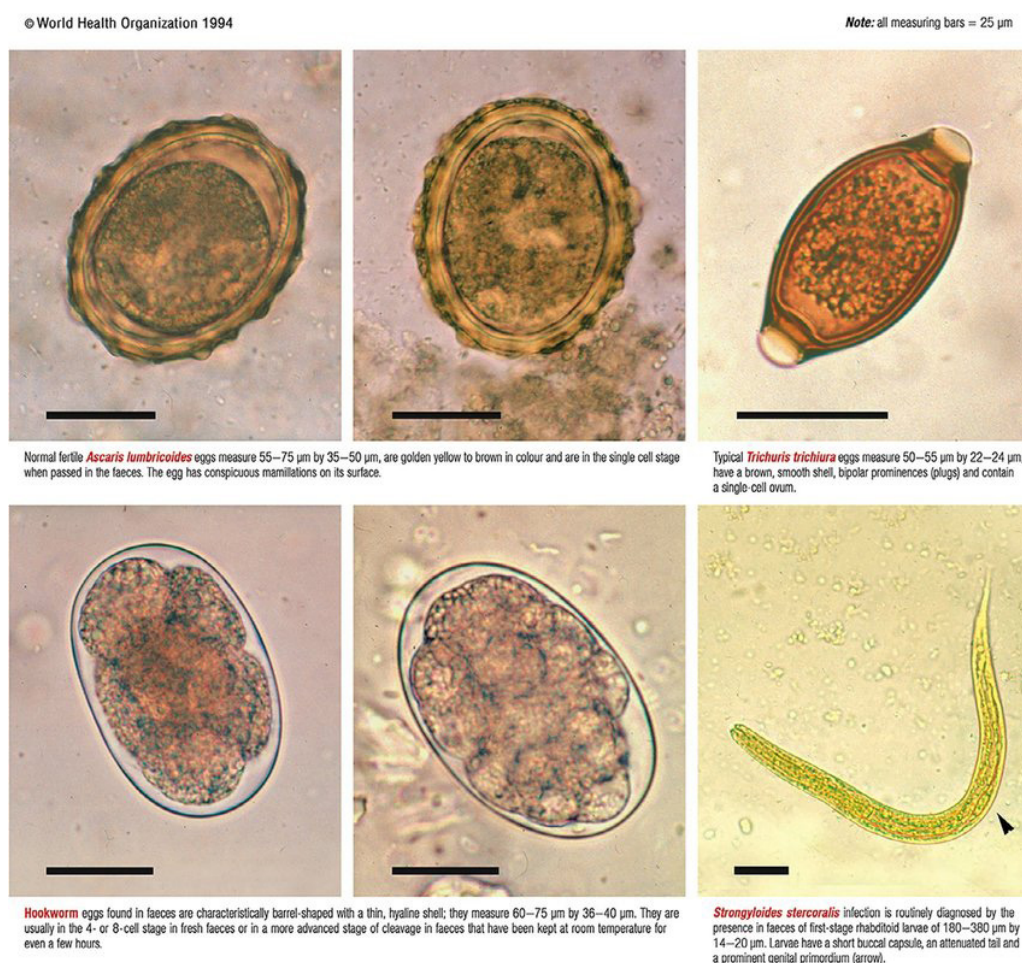


Figure 1. Some of the Parasites that Can Be Found in Stool Test.

**Conflict of Interests**

None.

**Ethical Issues**

Not applicable.

**Acknowledgments**

The author would like to express his deep gratitude to Islamic Azad University Tabriz Branch for offering valuable theoretical and practical assistance to the researcher in the present study.

**Funding**

The author received no financial support for the research, authorship, and publication of this article.

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