

Challenge PA1707-1

July 2017

Stool: *Ascaris* species, *Blastocystis hominis*

CMPT QA/QC/ Statistics

This sample was verified by two reference laboratories. Laboratories were expected to report the presence of *Ascaris* species and *Blastocystis hominis*.

All challenge components are confirmed before shipping by the reference laboratories. No further statistical analysis is performed on the results beyond that described under "Suitability for grading."

SURVEY RESULTS

Reference laboratories: both laboratories reported *Ascaris* species and *Blastocystis hominis*. Other parasites detected were Hookworm and *Trichuris trichiura*.

Participants (Table 1): All participants correctly reported the presence of *Ascaris* species eggs; 17/18 (94%) laboratories also reported *B. hominis*; 3 laboratories reported *Trichuris trichiura* eggs and 2 participants reported the presence of Hookworm eggs.

Suitability for Grading

A challenge component is considered suitable for grading if agreement is reached by both (100%) reference laboratories and at least 70 percent of the participants.

Parasite identification was correctly performed by both reference laboratories and greater than 70 percent of all laboratories and was, thus, determined to be suitable for grading.

IDENTIFICATION

The diagnosis of ascariasis is typically made by finding fertilized and unfertilized eggs in stools. Adult or juvenile worms can also be found in stools while *Ascaris* larvae may be found in the sputum or gastric washings between the eighth and sixteenth day after exposure.¹⁻³

Adult Worm: The adult worm is large, creamy white or pink, long, cylindrical and tapers at both ends. The female worms are 20 to 35 cm long and 3 to 6 mm in diameter and the male worms are 15 to 30 cm long and 2 to 4 mm in diameter.^{1,2}

Ascaris is the largest intestinal nematode of man. The female worms are larger than the males. Adult worms do not multiply in the human host, so worm burden is related to the degree of continual exposure to infectious eggs over time. As worm burden increases, egg production per female worm tends to decrease.

Eggs: *Ascaris* species eggs may be fertilized or unfertilized and first appear in the feces 60 to 75 days after exposure. There is a wide variation in the size and morphology. The fertilized egg is ovoid, generally not mammillated, and golden brown. It measures 30 to 40 µm by 50 to 60 µm and has an outer irregular dense shell and a regular translucent inner shell. Unfertilized eggs are usually more oval, measure up to 90 µm long, and may have a pronounced mammillated coat or an extremely minimal mammillated layer.¹⁻³

Ascaris Diagnosis

The diagnosis of ascariasis through the detection of eggs excreted in stool has some important limitations recently reviewed by Vlainck et al.⁴

1- The standard techniques for diagnosing *Ascaris* eggs in stool are affected by variations in day-to-day egg excretion, heterogeneous egg distribution in stool samples and low sensitivity of the technique.⁵ Increasing the number of stool collections, combination of techniques to improve recovery, also increases technical, financial, and human resources requirements.

2- Eggs cannot be demonstrated in stool until the worms have grown, mated and produced eggs, which takes several weeks.³

Grading

Reporting the presence of *Ascaris* species and *Blastocystis hominis* was graded acceptable.

Not reporting the presence of *Blastocystis hominis* was graded unacceptable.

Table 1. Results reported

Reported	Total	Grade
<i>Ascaris</i> species	1	Unacceptable
<i>Ascaris</i> species, <i>Blastocystis hominis</i>	17	Acceptable
& <i>Endolimax nana</i> (3)		Acceptable
& <i>Trichuris trichiura</i> (3)		Acceptable
& Hookworm (2)		Acceptable
Total	18	

Cautions:

Unfertilized eggs do not float with use of the zinc sulfate flotation concentration method (the eggs are too heavy).

If too much iodine is added to the wet preparations, the eggs may look like very dark debris. Eggs may be very difficult to identify on a permanent stained smear because of stain retention and asymmetric shape.¹

3- Egg production depends on worm density in the intestine, male/female worm ratio, and immunity development.^{6,7}

4- The morbidity of the infection while immature stages are migrating through organs other than the intestine is poorly explored as this stage occurs without ever producing eggs in feces.⁴

Serology

Although there are several serologic tests which can detect antibodies to *Ascaris*, there is no specific immunodiagnostic test, since antibodies to *Ascaris* often cross-react with antigens from other helminths.

Prevalence

Adult *Ascaris* live 10-24 months in the jejunum and middle ileum of the intestine. Each day, female *Ascaris* worms produce 240,000 eggs, which are fertilized by nearby male worms.⁹ When only unfertilized eggs are found in the stool, this may be indicative there are no male worms present.

It has been estimated that more than 1.4 billion throughout the world are infected with *Ascaris*. The majority of infections occur in Asia; ascariasis is highly endemic in China and Southeast Asia, the prevalence is high in Latin America and has not changed over the years. In Europe, the prevalence is low in large cities but may be high in rural areas where it can reach up to 52%. In the United States, ascariasis is the third most common helminthic infection (exceeded only by Hookworm and *Trichuris trichiura* infections).²

CLINICAL RELEVANCE

Approximately 85% of individuals infected by *Ascaris* are asymptomatic.² The most common symptoms are diarrhea and upper abdominal discomfort of varying intensity.^{1,3}

Infection occurs most commonly through hand to mouth transmission; it is found in association with poor personal hygiene, poor sanitation,

and in places where human feces are used as fertilizer. Consumers of uncooked vegetables and fruits grown in or near soil fertilized with sewage are most at risk for acquiring infection. Water is rarely implicated as a source of *Ascaris*.²

Large numbers of adult worms can cause mechanical blockage of the intestinal tract, especially in children, and worms penetrating the host's intestinal wall can result in peritonitis.¹

The host can experience allergic responses due to metabolic excretions and secretions of adult worms. During movement through the lungs, the larvae may provoke an immune mediated hypersensitivity response. In severe cases, patients may develop dyspnea and an eosinophilic pneumonia (Löfller syndrome).^{1,8} Not all larval or adult worms stay on the path that is optimal for their development; those that wander may locate in diverse sites throughout the body and cause complications.

REFERENCES

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Live fertilized *Ascaris* eggs

One participant reported the presence of live fertilized *Ascaris* eggs.

Although this is a rare occurrence, *Ascaris* eggs are very resistant to different preservatives. In general 10% formalin is enough to kill most eggs.

In this case, the sample had been stored in 10% formalin for at least several months.

Although the finding could surprise some laboratorians, the presence of live fertilized eggs does not change the biosafety level of the parasitology sample.

Standard biosafety precautions should be applied to all parasitology samples.

On the other hand, even in the event of the egg hatching, the larva would have no chance of survival in the preservative solution.