Unusual association of diseases/symptoms

Arthropod larvae misidentified as parasitic worm infection

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A healthy, asymptomatic man living in London, presented with seeing 'worms' in his toilet for two successive summer seasons. Repeated microscopic examination and cultures of both his faeces and urine were normal. He was empirically treated with multiple courses of anthelmintics without resolution of this problem. A sample of the worms was obtained, and positively identified as arthropod larvae under microscopic examination. These larvae do not parasitically colonise humans. It was subsequently deduced that a flying arthropod (most likely *Culex pipiens* mosquito) had laid eggs in standing toilet water, and the hatched larvae had been mistaken for parasitic worms. The patient was declared free of parasites and remains healthy. This case illustrates the dangers of starting empirical treatment without positive confirmation of causative organisms, which can result in unnecessary and potentially harmful treatment.

BACKGROUND

A substantial number of patients present to primary care reportedly seeing worms in the toilet. As treatment is largely safe and effective, empirical therapy is frequently started without formal identification of likely parasites. However, if putative organisms are diagnosed incorrectly, the patient may be treated with multiple cycles of therapy for seemingly recalcitrant and recurrent parasitic infections with little effect. In this case, a correct diagnosis with early identification of putative organism would have prevented unnecessary investigation, treatment and worry for the patient and his family. It is likely that this misdiagnosis occurs in a significant number of patients presenting in this way in London and other cities. We hope to increase awareness of this possibility among general practitioners to avoid unnecessary treatment in other patients presenting in a similar way.

CASE PRESENTATION

A 39-year-old man presented to primary care reporting that he was seeing wriggling worms in his toilet over the spring and summer seasons. He was not sure if the worms originated from his urine or his faeces. He also had recently had a routine private medical check-up, which detected dipstick positive haematuria. Apart from general tiredness, he had no other symptoms (eg, pruritus ani etc). He lived in London and occasionally visited Brazil.

He reported a similar sighting of worms around the same time last year. At that time, a clinical diagnosis of *Enterobius vermicularis*¹ was made without formal laboratory identification. Based on this diagnosis, he and his family were treated with a course of mebendazole at the time with no visualisation of worms for the rest of the year.

He had no other relevant medical history or family history, and was not on any regular medication.

On examination, he had a normal cardiovascular, respiratory and abdominal examination including a normal PR and normal blood pressure. His urine dipstick was positive for haematuria.

INVESTIGATIONS

The patient was investigated with a view to identify any parasitic colonisation. Microscopic examination of faecal and urine samples did not detect any parasites or eggs or abnormal growth. Baseline bloods were normal – notably showing no anaemia, eosinophilia or raised inflammatory markers. After advice from the secondary care infectious diseases team, the patient was treated empirically with another course of mebendazole, as the clinical presentation did not fit any particular parasite. The haematuria was thought to be unrelated.

A few weeks later, a sample of the worm was obtained, which was approximately 10 mm in length with a translucent digestive tract. It was motile, with a large head and thorax segments, with brushes throughout the length of its body. Since no nematodes possess a thorax the sample was sent for further identification. It was subsequently identified as an arthropod larva, however, apart from the phylum, further taxonomic classification could not be made. Discussion with the infectious diseases team confirmed that there were no known arthropods that parasitise the human gastrointestinal or genitourinary tract.

DIFFERENTIAL DIAGNOSIS

Given his normal investigations and the identification of non-parasitic larvae, it was very unlikely that the patient was harbouring any parasites. On further specific questioning, the patient confirmed that there were insects in his bathroom from time to time, especially in the spring and summer months. He also reported that he has visualised worms in clear toilet water (when the toilet was unused for a time). Finally, we deduced that flying insects were laying eggs in his toilet and the hatched insect larvae were being misidentified as worms by the patient. These episodes were only visualised by the patient in the warmer spring and summer seasons, as this was the period of increased insect reproductive activity.

Figure 1 Comparative appearance of mosquito larvae from different genera (reproduced with permission from Richard Russell).

TREATMENT

Reassurance was given to the patient. No further treatment was indicated.

OUTCOME AND FOLLOW-UP

Patient was subsequently investigated for his haematuria, which was found to be benign. His tiredness was stress related and improved after lifestyle modification. The patient and his family remain healthy and well. It was suggested that they use a chemical cleaner in their toilet cistern that may help kill the eggs, before they hatch into larvae.

DISCUSSION

In our literature search, we did not encounter any similar cases. There are many types of flying insects from the phylum arthropoda. We deduced the larvae in this case are most likely to be from the mosquito *Culex pipiens* (genus, species). This is based on features of the mosquito's distribution and reproductive cycle as well as characteristics of the larvae (figure 1).

The *C pipiens* mosquito is very common in London.² *C pipiens* are a non-human biting species, preferring instead to feed on birds.³ It is known to lay eggs in any type of standing water, with increased activity in the warmer spring and summer months.^{2 3} There have been reports of these mosquitoes in sewage treatment plants in London boroughs.² These mosquitoes have a holometabolistic

reproductive cycle, where eggs change into larvae, pupa and finally the adult mosquito.⁴ Eggs hatch into motile aquatic larvae in approximately 30 h (quicker in warmer temperatures).⁵ The larval stage is the longest stage in the preadult development cycle, lasting up to 135 h.⁵

We hypothesise that during the warmer seasons, *C pipiens* would have laid its eggs in the standing water of the toilet pan, preferentially at night.⁴ These non-motile eggs are unlikely to have been noticed by the patient, as the eggs are small (3–6 mm)⁴ and there is reduced toilet use overnight. However, once they hatch into larvae, these would be easily visualised as the larvae are motile, larger (approximately 12 mm) and remain in the larval stage for a significant time (7–14 days).⁴ These larvae would have been flushed away during normal daily use of the toilet, with no time to develop into the pupal stage. Hence, as the motile larvae would be the only developmental stage visualised, it would have been mistakenly assumed that these were 'parasitic worms'. As new eggs are laid, these would develop into new larvae (to replace those flushed away). This would have led to the belief that these 'parasitic worms' were persistent.

We believe this is probably a very common scenario, in the UK, and globally (especially in areas where human populations and flying arthropods co-exist in close proximity –eg, rural tropics). As part of normal management of this condition, we believe that a large number of patients

would have undergone unnecessary and potentially harmful treatment. We hope that this can be prevented in the future by bringing this diagnostic possibility to the attention of other medical practitioners. Future cases may well lead to other genera of flying arthropods being implicated.

Learning points

- ▶ Empirical treatment is not efficacious if putative organism is incorrect.
- ▶ Investigation and identification of infectious organisms should be undertaken concurrently with the start of empirical therapy.
- ▶ Diagnosis should be re-evaluated if empirical therapy is ineffective, as opposed to repeating blind empirical therapy.

Competing interests None.

Patient consent Obtained.

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