



# ARDS

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## Further Information about Strongyloides

The following information has been compiled by ARDS to assist people in understanding Strongyloides infection. There is a detailed list of references at the end of the document.

### Affects Aboriginal people

**Strongyloides are found in many parts of the world including Aboriginal tropical northern Australia.**

*Strongyloides stercoralis* are tiny parasitic worms that infect many Aboriginal people who live in tropical Australia <sup>1,2,3,4,5,6</sup>. The infective worms are found in or near faeces from infected people. When the infective worms get on to the skin, they burrow through the skin and cause a disease called *strongyloidiasis* <sup>7</sup>. This disease can be diagnosed and cured <sup>8</sup>, but because its symptoms mimic those of other diseases, strongyloidiasis is often not recognized. A person with *Strongyloides* whose immunity is impaired is in danger of dying. <sup>9,10,11,12,13,14</sup> Under those circumstances, the worms multiply rapidly, invade any part of the body and overwhelm the patient. <sup>7,10</sup> Secondary bacterial infection increases the intensity of the illness. <sup>13,14,15</sup> If such patients are not promptly diagnosed correctly and given the specific treatment for *Strongyloides*, they die. <sup>14</sup> *Strongyloides* also affects refugees and immigrants from parts of the world where the disease is endemic <sup>16,17,18</sup> and ex-servicemen and others who have spent time in these areas of endemicity. <sup>19,20</sup>

### A disease for life

**People with *Strongyloides* remain infected for life unless they get treatment that eliminates all the worms.**

People with *Strongyloides* have the worms until they die, unless they receive effective treatment. Typically, people with Chronic Strongyloidiasis have the disease for decades before being diagnosed and treated. <sup>19,20</sup> Their immune system keeps the worms in check but never eliminates the worms. <sup>16,17</sup> The adult worms are stunted and their reproductive rate is slow. <sup>7</sup>

## Deaths from corticosteroids

**Treatment with corticosteroids precipitates severe strongyloidiasis and death unless the patient receives effective treatment in time.** <sup>10</sup>

60% of deaths due to strongyloidiasis are caused by the administration of corticosteroid drugs to patients with chronic strongyloidiasis.<sup>10,14</sup> When these drugs are present in the body, the adult worms recover and multiply out of control. Other conditions which depress the immune system also lead to severe strongyloidiasis and death if not successfully treated.<sup>4</sup> These conditions include malnutrition<sup>9</sup> and HTLV-1 infection.<sup>21,22</sup> The duration of the final illness varies from 1 to 90 days with a mean of 14 days.<sup>1</sup> Corticosteroids are sometimes given to patients for respiratory symptoms due to migrating larvae.<sup>10,18</sup>

## Transmission

***Strongyloides* spread when a person comes into contact with infective worms in or near faeces from a person with *Strongyloides*.**

People get *Strongyloides* when immature infective *Strongyloides* touch the skin and enter the body through the skin. The infective *Strongyloides* are present in or near faeces from a person with *Strongyloides*.<sup>7</sup> The infective *Strongyloides* live outside the body for a short time, a few hours or a few days.<sup>23</sup> They die if they are too hot or too cold or too dry and die within 3 weeks even when the conditions are just right for them.<sup>7</sup> People who live in the same household as someone with *Strongyloides* are more likely to have the disease than their neighbours.<sup>24</sup>

## Life Cycle

***Strongyloides* cycle through the body and the soil and also multiply inside people.**

Inside the body, *Strongyloides* migrate through the tissues until they reach the small intestine. They burrow into the mucosa where they lay embryonated eggs. The eggs hatch quickly, and the larvae escape into the lumen of the small intestine. Some pass out of the body with the faeces, others develop quickly and penetrate the body through the side of the lower intestine, and migrate through the tissues until they reach the small intestine where they also become adults and reproduce. In this way *Strongyloides* multiply in the body.<sup>7</sup> Some of the larvae leave the body with the faeces. Some become infective very quickly, others become adult and complete a single generation in the soil.<sup>25</sup> Then they can only reproduce again when they enter another person through the skin. *Strongyloides* in the soil are killed by heat, cold or dry conditions. They usually live for a few hours or a few days.<sup>23</sup> Under the best conditions, they may survive for about 15 days.<sup>7</sup>

## Secondary Infection

**Strongyloidiasis is frequently accompanied by secondary infection by gut bacteria.**

When *Strongyloides* multiply in the body, the infective larvae carry gut bacteria with them into the body when they enter the body through the side of the lower gut, and they take the bacteria with them to any part of the body<sup>15</sup>. The bacteria may cause pneumonia, meningitis or septicaemia,<sup>13,14,15</sup> or abscesses in the liver or kidneys. Infections in many parts of the body with species of bacteria that normally live in the gut may indicate an underlying infection with *Strongyloides*.<sup>14</sup>

## Symptoms are Non-Specific

**Symptoms of *Strongyloides* often mimic other diseases.**

Abdominal pain and diarrhoea, itchy skin rashes, respiratory symptoms are common symptoms of chronic strongyloidiasis. These same symptoms in a more severe form and shock are common symptoms of severe *Strongyloides* disease (Acute Strongyloidiasis and Disseminated Strongyloidiasis or Hyperinfection).<sup>13,14</sup> *Strongyloides* may cause symptoms in many parts of the body.<sup>13,14</sup> The only symptom that is found only in Strongyloidiasis is larva currens, a raised rash that moves randomly across the skin typically at about 2 cm in an hour.<sup>13</sup>

## Tests

***Strongyloides* is usually diagnosed by a blood test or a faecal test.**

For those people with chronic *Strongyloides* disease a simple blood test will tell whether they have *Strongyloides*. The blood test is for specific IgG antibodies to *Strongyloides*. A positive test indicates current infection,<sup>8</sup> not a past infection. Stool tests are very insensitive for chronic strongyloidiasis.<sup>26,27</sup> People who acquired *Strongyloides* recently<sup>28</sup> people with HTLV-1 infection, and people with severe disease may not have the antibodies.<sup>7,22</sup> Their faeces should be examined for *Strongyloides* using the agar plate test.<sup>7,27</sup> A positive value from any one test indicates *Strongyloides*.

## Treatment

**Ivermectin is a safe drug<sup>29,30</sup> and the most effective drug available for *Strongyloides*.**

Ivermectin 0.2mg/kg is the most effective drug. It cures about 80% of patients.<sup>31</sup> Albendazole 400mg for 3 days, the standard treatment cures only about 40% of patients.<sup>31</sup> When Albendazole is given twice daily for 3 days it is 75% effective.<sup>33</sup> Two courses of treatment are more effective than one.<sup>8</sup> All the worms must be killed by the treatment, or the remainder will multiply again in the body and reestablish the patent infection.<sup>7,32</sup>

## Defining Cure

**Criterion for cure is negative blood test, negative stool test and no symptoms, all three.**<sup>33</sup>

The serum of a person who has been cured becomes negative by 6 months after treatment. If the test is positive, they still have *Strongyloides* and must be treated again. The process must be repeated until the test is negative and the person has no symptoms.<sup>8</sup> Even if the test is negative, if symptoms persist, the person needs retreatment.<sup>33</sup> If repeated treatment does not kill all the worms, the person must be treated periodically so that only a few worms remain in the body.<sup>21</sup>

## Reservoir is human

**Infected people are the reservoir for *Strongyloides* infection. Mass treatment by ivermectin is likely to markedly reduce transmission.**

Strongyloidiasis is a preventable disease. Where there is a good water supply and sanitation and good hygienic practices, there is no transmission of the disease.<sup>20</sup> People are the reservoir for *Strongyloides*. *Strongyloides* live for only a short time outside the body.<sup>23</sup> If *Strongyloides* worms are eliminated from everyone in a community at the same time during the dry season, there is a good chance of eliminating it from that group of people.<sup>5</sup> Vigilance should be exercised because infected visitors could reestablish *Strongyloides* in the community.

## Cost

Most of the cost of Strongyloidiasis is borne by the individual sufferer in the form of chronic ill health, loss of earnings, cost and pain of medical investigations, and the psychological pain that is caused by medical practitioners who do not believe their symptoms are real. There are also hidden costs to the health system as sufferers unsuccessfully seek a diagnosis of their illness. This can include the considerable cost of evacuation of patients from remote communities and the cost of treatment in intensive care for those with the severe form of the disease.<sup>34</sup>

## Additional information

*Strongyloides stercoralis* endemicity in Australia includes subtropical as well as tropical regions. It occurs in Northern New South Wales in the Northern Rivers region,<sup>35</sup> in Central Australia where it coexists with HTLV-1 that affects 12% of the Indigenous population.<sup>36</sup> The response of *Strongyloides* to various drugs varies.<sup>38</sup> There is dose-dependent eradication of adult worms and larvae and surviving larvae do not mature with Ivermectin. Albendazole also causes dose-dependent eradication of adults in the gut and larvae in the tissues, but Ivermectin is more effective. Cambendazole eliminates adults and larvae. Mebendazole kills adults but not larvae, but is between 100 and 1000 times less effective than Cambendazole. Thiabendazole was previously believed to be

effective, but it does not kill the adult worms. It reduces larval output and has no effect on larvae in the tissues. Further evidence of the use of repeat IgG serology after 6 months to check for cure has been obtained from a treatment study in Central Queensland.<sup>39</sup>

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