

# CHAPTER I

## INTRODUCTION

### 1.1 Background of study

Soil-transmitted helminths are worms that to complete its life cycle requires appropriate soil to develop into the infective form.<sup>1</sup> There are five species of STH (Soil-transmitted helminths) which are roundworms (*Ascaris lumbricoides*), whipworm (*Trichuris trichiura*), hookworm (*Necator americanus* and *Ancylostoma duodenale*) and *Strongyloides stercoralis*.<sup>1,2</sup> Four first-mentioned species are endemic worms in Indonesia.<sup>3,4</sup>

Diseases caused by helminth infection are still endemic in many regions of the world, especially in developing countries and tropical countries where soil condition supports the worm to growth as well as its low environmental sanitation and low personal hygiene.<sup>5,6</sup> World Health Organization (WHO) estimates that approximately 2 billion people worldwide are infected by parasitic worms,<sup>5,6</sup> of which about 300 million people suffer from severe helminth infections and each year approximately 150,000 deaths occurred due to infections caused by soil-transmitted helminths.<sup>5,1</sup> Chronic infection caused earthworms counted as a global problem because it causes rate of disability living (*Disability-adjusted life years*) by 39 million each year.<sup>7,8</sup>

In Indonesia itself, about 60 percent of the 220 million Indonesian population suffered from helminth infection.<sup>4</sup> Geographical position of Indonesia's tropical climate suitable for parasite to growth. *Geographical Information System (GIS)* stated STH distribution in Indonesia covering the entire islands in Indonesia, where the highest prevalence found in Papua and North Sumatra with a prevalence of between 50% to 80% .<sup>6</sup> The number is very high but the disease caused by helminth infections especially Soil-Transmitted Helminths still a disease that received less attention and tend to be ignored by the people in the world and also in Indonesia (*neglected disease*). Neglected disease does not cause sudden outbreaks and largely asymptomatic. But the group of neglected diseases likely to cause disability, decreased quality of life and intelligence of children, and can lead to mortality.<sup>6,9</sup>

Nowadays, there is a tendency to override diagnostic approach and more emphasis on the era of " preventive therapy" . Accurate diagnostic approach is not emphasized enough in most cases and in control monitoring programs in the community at risk . This poses a diagnostic dilemma , where is more effective intervention in reducing the parasite egg excretion , more reducing the sensitivity of direct diagnostic test of parasitology.<sup>7,10</sup> Key strategies held by the Indonesian government in reducing mortality and comorbidities caused by soil -transmitted helminths infections is by providing antihelminth drugs on a large scale for the high risk group, usually without waiting for definitive diagnosis (*Blanked/Selective Mass Treatment on Program Pengendalian Penyakit Cacingan Kementerian Kesehatan RI 2006*).<sup>1,11</sup> The behavior of patients who do self-

treatment only based solely on the suspicion that just because the child can not be fat , not based on the results of the laboratory examination.<sup>3</sup> This strategy is called ' preventive therapy ' / ' prevented chemotherapy ' . However, the use of drugs can lead to widespread resistance, or the most likely decrease the effectiveness of drugs to combat STH infection.<sup>1,2,12</sup> As a result, the reducing of infection prevalence causing a direct diagnostic test becomes less sensitive. Though, the definitive diagnosis is very important to the accuracy of therapy and treatment in endemic situations, to assess the level of infection, and to monitoring the effectiveness of drugs and pharmacovigilance.<sup>7,9</sup> To that its necessary to have a diagnostic methods that have a high sensitivity to infection with a low number of eggs in the stool (light infection).<sup>10</sup>

In general, the diagnosis of worm infection can be made clinically and epidemiologically. Clinical diagnosis of worms disease, especially hookworm (*Ancylostoma duodenale* and *Necator americanus*) can not give the right diagnosis because of hookworm not provide clear clinical symptoms, thus to assist the diagnosis required laboratory examination.<sup>13</sup> On direct examination, severe infection is easily to diagnose, while light infection can be examined by sedimentation method and parasite culture.<sup>13</sup> Examination of soil-transmitted helminths can be done by finding the worm eggs or adult worms in the stool examination.<sup>14</sup> Nowadays the most widely used technique in the operational diagnosis of parasitic either within the scope of the clinical and epidemiological survey was flotation method.<sup>14</sup>

Flotation technique showed high sensitivity as a diagnostic method of soil-transmitted helminths with a light infection (low infection rate). Therefore it's widely used as a definitive diagnosis in hospital and the scope of epidemiological surveys. Besides, this technique is quite complex and expensive due to the use of centrifugation but still the best method among the other methods.<sup>7</sup>

In general, the effectiveness of stool flotation examination is affected by the type of flotation solution, specific gravity of eggs and solution, flotation time (flotation period), and the homogeneity of the solution after the centrifugation process.<sup>16</sup>

The problem is many of laboratories doesn't have standart operational procedure (SOP) of flotation method. In other hand, this SOP is needed by the laboratorian to measure the most effiience of time and diagnostic method of Soil-Transmitted helminth infection. This research tries to solve that problems.

This study aims to compare the effectiveness of NaCl, MgSO<sub>4</sub> and ZnSO<sub>4</sub> as flotation solution in flotation method and the best optional period for each floating solution in relation to the effectiveness which is drawing by counting number of eggs . This research has not been conducted before, thus this researcher propose to do this research. The results of this study are expected to become a reference of standard operational procedure for the diagnosis of parasites in both clinical laboratories also for further research.

## **1.2 Research questions**

- 1) Is there any difference of effectiveness of flotation method which is treated with NaCl, MgSO<sub>4</sub>, and ZnSO<sub>4</sub> as flotation solution?
- 2) When is the optional period that gives the best effectiveness of flotation method which is treated with NaCl as flotation solution?
- 3) When is the optional period that gives the best effectiveness of flotation method which is treated with MgSO<sub>4</sub> as flotation solution?
- 4) When is the optional period that gives the best effectiveness of flotation method which is treated with ZnSO<sub>4</sub> as flotation solution?

## **1.3 Research purposes**

### **1.3.1 General purposes**

To find the best method of stool examination as operational standards laboratory in the diagnosis of intestinal parasites especially Soil-Transmitted Helminths.

### **1.3.2 Special purposes**

- 1) To compare the difference of effectiveness of flotation method which is treated with NaCl, MgSO<sub>4</sub>, and ZnSO<sub>4</sub> as flotation solution.
- 2) To know the optional period that gives the best effectiveness of flotation method which is treated with NaCl as flotation solution.

- 3) To know the optional period that gives the best effectiveness of flotation method which is treated with  $\text{MgSO}_4$  as flotation solution.
- 4) To know the optional period that gives the best effectiveness of flotation method which is treated with  $\text{ZnSO}_4$  as flotation solution.

#### **1.4 Research benefits**

- 1) Helping clinical laboratories in both clinical scope (hospital) also academic scope (medical parasitology and research institution) in determining operational standards with the best effectiveness in diagnostic of parasites.
- 2) Giving consideration for further research on flotation method.
- 3) Contributing ideas about the role of flotation as an effective method for the diagnosis of parasitic worms especially Soil-Transmitted Helminths in the scope of the clinical and epidemiological survey.

## 1.5 Research originality

**Table 1.** Research originality

No	Articles	Methods	Results
1	Ketut Nugraha. Pengaruh Magnesium Sulfat Pro analisis dan Garam Inggris serta Periode Opsional terhadap Efektivitas Pemeriksaan Tinja Flotasi [dissertation]. Denpasar (Indonesia): Universitas Udayana; 1996	Experimental research; Complete randomized factorial design (2x5); Human faeces; Optional Period (20,30,40,50,60 minutes) with best effectiveness in flotation method used MgSO <sub>4</sub> Pro analyst and MgSO <sub>4</sub>	Effectiveness obtained from both MgSO <sub>4</sub> .7H <sub>2</sub> O also MgSO <sub>4</sub> pro analysis slightly different for every level of an optional period, but the difference variance test was not significant (P>0.05).
2	M. W. Dryden, DVM, PhD, et al. Comparison of Common Fecal Flotation Techniques for the Recovery of Parasite Eggs and Oocysts. Veterinary Therapeutics [article]. 2005. 6(1):15-28. <sup>19</sup>	Experimental research: complete randomized; soil in controlled conditions; The variables evaluated were: filtration, resting time, washing solutions, time of homogenization, resuspension of sediment, and type and density of flotation solutions in different of flotation solutions.	The rates of recovered eggs were higher using zinc sulfate (s.g= 1.20g/cm <sup>3</sup> ) and sodium nitrate. It also observed in the present study that the latter solution crystallized quickly during examination periods, making the viewing of eggs difficult and drying them up.

The differences of this research with the previous studies are the independent variable, optional period and the experimental object. This study principally measures the effectiveness of saturated NaCl, saturated MgSO<sub>4</sub> and saturated ZnSO<sub>4</sub> as flotation solution in flotation method and the best optional period for each floating solution in relation to the effectiveness which is drawing by counting number of eggs .