20 YEARS OF PROGRESS IN INTESTINAL PARASITIC DISEASES RESEARCH

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Since 1968 investigators from U.S. Naval Medical Research Unit No. 2 Detachment (NAMRU-2) and the National Institute of Health Research and Development (NIHRD) have conducted parasitological/biomedical surveys in every major island in the Indonesian archipelago. Even smaller islands such as Nasi and Beras off of Sumatra and Beeuw off of Irian Jaya are represented in these studies. These activities were aimed to update and provide new information on the prevalence and distribution of intestinal parasites as well as other infectious agents.

These surveys were done in collaboration with the Directorate General of Communicable Disease Control and Environmental Health (CDC&EH), universities and other health institutions such as the Indonesian Armed Forces Health Services, Provincial Health Services, and others.

Stool specimens, blood smears, and venous blood examined in these studies showed that most of the population surveyed were infected with one to 7 different species of parasites[5-7]. Between 50% to 95% of the population had multiple infections.

INTESTINAL HELMINTHS

There are significant variation in infection rates with helminths among the islands. Infection with soil transmitted helminths is more prevalent. Among them, *Trichuris trichiura, Ascaris lumbricoides* and hookworm were the most commonly found helminths in these studies[1-25]. The rate for *T. trichiura* in Irian Jaya was among the highest encountered (83%)[11]. *Ascaris lumbricoides* was more or less equally distributed between males and females throughout all age groups[1,5,7], while hookworm was more common among males than females and more prevalent in the older age groups[2,5-7].

In most of the reports the species of hookworm was not identified, however, Clarke *et al.* (1974) demonstrated that *Necator americanus* was the agent responsible for hookworm disease in the Lindu Valley of Central Sulawesi[1,25].

The other species of intestinal helminths which were detected in these surveys were *Enterobius vermicularis, Strongyloides stercoralis, Taenia* sp., *Hymenolepis* sp., *Trichostrongylus* sp., *Echinostoma* sp., and *Diphyllobothrium* sp.[1-25]. *Enterobius vermicularis* was found in a low percentage of the population. This can be attributed to the techniques employed in these studies (direct and formalin ether concentration methods) which are not recommended for the detection of *E. vermicularis* eggs[1,8]. The techniques employed

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in these studies may also be responsible for the low detection rate for *S. stercoralis*[8].

In the mountainous regions (less than 1550 meters) of Sulawesi, *A. lumbricoides* (52-92%), *T. trichiura* (38-46%) and hookworm (25-75%) were the most commonly diagnosed helminths, although infection rates were variable between sites studied[1,10,25]. *Taenia* sp. infection in the human population of Timor was reported for the first time[4]. *Diphyllobothrium* sp. was detected in Central and South Sulawesi[5] while *Echinostoma* sp. was detected in South Kalimantan and Central Sulawesi[10,11].

INTESTINAL PROTOZOA

It appears that poor environmental sanitation, personal hygiene, and low levels of awareness of preventive measures of parasite transmission are the most important factors in the acquisition of protozoan infections.

Most of the protozoan forms found in the feces were cysts. The most common protozoa found in these studies were *Entamoeba coli, E. histolytica, Endolimax nana, Iodamoeba butschlii, Giardia lamblia* and *Chilomastix mesnili*[1-25]. Entamoebic infections and *I. butschlii* infections increased with advancing age while other infections were evenly distributed between age group and sex. Conversely, *G. lamblia* infections appears to decrease with age[7-8,12]. *Balantidium coli* infection was found in Alor where pork consumption is common practice in those areas, and it was also found in Palu Valley of Central Sulawesi[10,18].

Antibodies to *E. histolytica* can often be demonstrated in serum when the parasite is absent or difficult to find in stools. Therefore serum surveys are becoming increasingly useful for estimating the prevalence of invasive amebae[12]. Comparing stool findings to serological findings is not realistic since matching specimens are not always obtained from the same individual. It is known that significant antibody levels remain elevated long after clinical disease or parasitological evidence of infection has disappeared[6,10].

Serologic testing for invasive amebiasis and *Toxoplasma gondii* infection have been done throughout many islands in Indonesia. The prevalence of antibodies to *T. gondii* was higher in females (2.7%) than in males (1.6%) in Central Java. Seropositivity rates of *E. histolytica* have varied from 4 to 34% with an average of 18%[12]. Distribution of positive titers of antibodies to *E. histolytica* antiamoeba by age and sexes show higher positive rates in males than females and it increased with age in both sexes[10,17]. A high prevalence of antiamoebic antibodies was found in Kresek, West Java (33%), where the prevalence of anti-toxoplasma antibody was also high (51%)[25].

In other areas of Indonesia, the prevalence of positive titers of antitoxoplasma antibody varied from 2 to 26%. These increased with age[10] and higher infection rates were detected in males compared to females[6].

TREATMENT OF INTESTINAL PARASITES

These collaborative studies also documented the utility of mebendazole, pyrantel pamoate and a combination of the two drugs in treatment of soil transmitted helminthic infection. These studies indicated that mebendazole is a slow acting broad spectrum

anthelminthic with a high efficacy against most of the common intestinal nematodes and with inhibiting action against larval development in the post treatment excreted eggs. Erratic ascariasis, however, was found but no other side effects were observed[19]. Pyrantel pamoate was a significantly better drug for both *A. lumbricoides* and hookworm infection but not for *T. trichiura*[21]. The combination of mebendazole and pyrantel pamoate is more effective than mebendazole alone, and adverse side effects or erratic ascariasis may be reduced or eliminated by the synergism of these two drugs[20].

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