IMPORTANT PROTOZOAN PARASITES IN INDONESIA

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ABSTRACT

The most important protozoan parasites in Indonesia are the malaria parasites, *Toxoplasma gondii* and *Entamoeba histolytica*.

After the second world war the residual insecticides and effective antimalarial drugs were used in the control of malaria. After development of resistance among mosquitoes to insecticides, the Malaria Control Programme was switched over to the Malaria Eradication Programme. Malaria incidence dropped heavily. However, due to the quick development of vector resistance and financial limitations, malaria came back and so did the Malaria Control Programme. *P. falciparum* and *P. vivax* are the most common species in Indonesia. Important vectors are *An. sundaicus, An. aconitus, An. maculatus, An. hyrcanus group, An. balabacensis, An. farauti* etc. *An. sundaicus* and *An. aconitus* have developed resistance to DDT and Dieldrin in Java.

In 1959 the Malaria Eradication Programme was started in Java, Bali and Lampung. In 1965 the API dropped to 0,15 per thousand. From 1966 onwards malaria transmission was on the increase, because spraying activities were slowed down, but dropped again from 1974 onwards by occasional residual house spraying with DDT or Fenitrothion, malaria surveillance and treatment of malaria cases, resulting in an API of 0.18 per thousand in 1987. At present malaria is not transmitted in Jakarta and in capitals of the provinces and kabupatens, except in Irian Jaya, Nusa Tenggara Timur and one or two other provinces, but it still exists in rural areas. The distribution of chloroquine resistant *P. falciparum* is patchy. Resistance is at the RI, RII and RIII levels.

The main problems of malaria control are : the increasing development of resistance of the vector to insecticides, the change of *An. aconitus* from zoophili to anthropophili and from indoor to outdoor biting, the increasing resistance of *P. falciparum* to chloroquine, the shortage of skilled manpower and limitation of budget.

In Indonesia many newborns with congenital anomalies are found. *T. gondii* as one of the causes, is widely spread in man and animals. The prevalence of Toxoplasma antibodies in man varies from 2 % to 63 %, in cats and other animals it can reach up to 75%. Confirmed cases of congenital toxoplasmosis are reported. The diagnosis of toxoplasmosis in the Department of Parasitology, University of Indonesia is done with detection of specific IgM and IgG antibodies with ELISA. A test for antigenemia to get a rapid and direct diagnosis of active infection is not yet available. A suitable Toxoplasma vaccine to prevent toxoplasmosis would be desirable. *E. histolytica* infection is endemic throughout the archipelago. The prevalence rates are 18 % to 25 % . Extraintestinal infection mostly occurs in the liver. Pulmonary amebiasis is occasionally found. Medication with metronidazole has obtained good results. Diagnosis of extraintestinal amebiasis in our laboratory is by the immunodiffusion test, which is not capable to differentiate active infection from infection in the past. A more accurate diagnosis would be the use of monoclonal antibodies to detect antigens.

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INTRODUCTION

Although the increasing number of antiprotozoan drugs available today, protozoan infections are a continuing problem in Indonesia. In many countries protozoan parasites formerly considered of no human importance are being found to infect man and cause disease, especially in persons with AIDS. Since AIDS victims are only occasionally found in Indonesia, these protozoan parasites are not important in this country. The most important protozoan para-sites in Indonesia are the malaria parasites, *Toxoplasma gondii* and *Entamoeba histolytica*. Only these three protozoan parasites will be discussed in this paper.

Malaria

Since the beginning of the twentieth century malaria was intensively studied in Indonesia by several scientists, leading to the understanding of malaria epidemiology. Local malaria control activities were based on detailed knowledge of the bionomics of the vector species combined with the characteristics of the malaria endemicity. The method employed was the alteration of the breeding places to make it unsuitable for a particular vector species to breed, called "species sanitation". Additional chemoprophylaxis with quinine in closed communities seemed to work fairly well to suppress malaria. Despite the large expenditure spent for the hygienic exploitation of fish ponds in Tanjung Priok, a serious malaria outbreak occurred in 1938 in Tanjung Priok and Jakarta.

After the second world war the residual insecticide and more effective antimalarial drugs were employed in the control of malaria. But soon it became clear that continuous insecticidal exposure caused resistance among mosquitoes. That's why the Malaria Control Programme was switched over to the time limited campaign called the Malaria Eradication Programme. Malaria incidence dropped heavily. Former hyperendemic areas were cleared from malaria in a rather short time. However, due to the quick development of vector resistance over an extensive area and financial limitations, malaria came back and so did the Malaria Control Programme. The strategy of malaria control nowadays is to use all available methods most suitable to the local conditions.

Of the four human malaria parasites, *P.falciparum* and *P.vivax* are the most common parasites. *P.malariae* is unevenly distributed. This species is rarely found in Java, but is still present in other islands. *P.ovale* is found in Owi, an island close to Biak, Irian Jaya, and one case has been reported in Timor (Gundelfinger et al., 1976, Quoted by Gandahusada[1]).

Waktudi Koesoemawinangun (1954) (Quoted by Gandahusada[1]) described 90 species of Anophelini in Indonesia, 16 of which are vectors of the malaria parasite. *An sundaicus* breeds in brackish water, marine fish ponds and lagoons along the coast. *An.aconitus* is found wide-spread in the interior of Java, in the lowlands as well as in the mountainous areas. This species breeds in rice fields, fresh water fish ponds and lakes, and is found in high numbers during harvest time. *An.maculatus* breeds in hilly and mountainous areas in small streams and springs in Java and Sumatra. *An.sinensis* and *An.nigerrimus* are the vectors breeding in rice fields and swamps, whereas *An.balabacensis* is the principal vector in forest areas. *An.koliensis, An.farauti* and *An.punctulatus* are vectors in Irian Jaya. *An.farauti* breeds everywhere. Other vectors of minor importance are *An.*

barumbrosus, An.ludlowi and An.barbirostris, An.subpictus, An. letifer and An. umbrosus.

After the use of residual insecticides, An.sundaicus has developed resistance in the northern and southern coastal areas of Java, and An.aconitus in various parts of Java. An.sundaicus became resistant to DDT in the northern part and to Dieldrin in the southern part of Java, but they became susceptible again once the concerning insecticide was withdrawn. It was thought that there might be some biological differences between the north and south coastal An.sundaicus, but the Ross Institute could not detect any. Since 1985 Fenitrothion is used in some places of Central Java where An.aconitus is resistant to DDT.

In 1959 the Malaria Eradication Programme was started in Java, Bali and Lampung. The result was an API per 1000 population of 0,15 in 1965. From 1966 onwards malaria trasmission was on the increase, because spraying activities were slowed down and *An.aconitus* became more widely resistant to DDT. The total positives (in thousands) increased from 8,9 in 1965 to 346,2 in 1973, and dropped again from 1974 onwards. The API per thousand decreased to 0,18 in 1987[2].

The present status of malaria in Indonesia is as follows : Due to the economic development of Indonesia, ecological improvement has been attained in all big towns of Indonesia. All breeding places of the malaria vectors have been eliminated in these urban areas. Malaria is not transmitted in Jakarta and in capitals of the provinces, except in Irian Jaya, Nusa Tenggara Timur and one or two other provinces. Even most of the towns of Kabupatens are free or almost free of malaria. However, malaria still exists in rural areas, with areas of high endemicity as in the Eastern part of Indonesia.

Since the report of the first case of chloroquine resistant falciparum malaria in Yogyakarta in 1973 (imported from East Kalimantan), all provinces except Yogyakarta have reported resistant falciparum foci in 1987. The distribution of resistant foci is patchy and seems to be correlated with the intensity of malaria transmission. Most of the foci are reported from the eastern part of Indonesia, and a focus is found in Central Java, where the local vector *An.aconitus* is resistant to DDT. *P.falciparum* is resistant to chloroquine at the R I, R II and R III levels in East Kalimantan, Irian Jaya and Central Java.[2]

The strategy of malaria control nowadays is as follows :

In Java and Bali :

1. Residual house spraying with DDT or other insecticides (Fenitrothion) in High Case Incidence Areas.
2. Surveillance of malaria.
3. Treatment of malaria cases.
4. Chemoprophylaxis for people going to higher endemic areas.

Outside Java and Bali :

1. Residual house spraying in economically important places and in transmigration localities.
2. Surveillance of malaria.
3. Treatment of malaria cases.

Every possible method of source reduction most suitable to local conditions is employed:

- Use of antimalarial drugs other than chloroquine, where *P.falciparum* resistance to chloroquine has developed.
- Use of insecticides other than DDT, where vector resistance to DDT has developed.

- Monitoring the susceptibility of *P.falciparum* to chloroquine and of the vector to insecticides.

Applied malaria research that have been conducted in Indonesia includes :

1) The testing and evaluation of alternative insecticides to use in areas where the vector is resistant to DDT.
2) The prevention of the further spread and development of *An.aconitus* resistance to DDT in Java by using an alternative insecticide on a selective base.
3) Diverting the vector from man to animal by keeping cattle outside the houses.
4) Biological control by *Poecilia reticulata* and other fishes, integrated with the Departement of Fishery and with community participation.
5) Intermittent irrigation, planting ricefields and harvesting at the same time, in cooperation with the Department of Agriculture.
6) Community participation in the treatment of malaria cases.

The development of a suitable vaccine to prevent malaria infection would be a great help in the combat against the disease.

Toxoplasmosis

In Indonesia many newborns with congenital anomalies are found. One of the causes is *Toxoplasma gondii*, which is widely spread in Indonesia in man and animals. Surveys for antibodies to *T.gondii* by use of the indirect hemagglutination test (IHA) have been carried out in several areas of Indonesia since 1973, but in these studies serum specimens were examined abroad, because the test was not available in Indonesia. A microtiter adaptation of the IHA test has been established in our laboratory in 1977.

The prevalence of Toxoplasma antibodies in man varies from 2% to 63%, in cats 35-73 %, in pigs 11-36 %, in goats 11-61 %, in dogs 75 % and in other cattle less than 10 %[3,4,5,6,7,8,9,10,11]. The prevalence of Toxoplasma antibodies in women of child-bearing age in Jakarta is 62,3 %[12], in pregnant women in Cipto Mangunkusumo Hospital 14,3 %[13], in hydrocephalic children 10,6%[14], in chorioretinitis patients 60 % and in patients with other eye lesions 17 %[15]. In patients with a history of one or more abortions or stillbirths in Jakarta the prevalence of Toxoplasma antibodies is respectively 21,5 % and 22,8 %[16]. Some confirmed cases of congenital toxoplasmosis are reported in Jakarta[12,17,18] and in Irian Jaya[19].

Nowadays the diagnosis of toxoplasmosis in our laboratory is done with detection of specific IgM and IgG antibodies with ELISA. A test for antigenemia appears to be promising for a rapid, direct diagnosis of active infection, but this test is not yet available. Prevention of the disease is most important in seronegative pregnant women and immunodeficient patients. Specific hygienic measures as cooking meat well, washing hands thoroughly after handling raw meat, avoiding contact with cat faeces, are the only methods available for the primary prevention of toxoplasmosis. It is also important to identify those women who acquire the infection during pregnancy, so that treatment during gestation or abortion can be considered. A suitable Toxoplasma vaccine to prevent toxoplasmosis would be desirable.

Amebiasis

Entamoeba histolytica infections are worldwide and more numerous in the tropics and subtropics. In Indonesia the disease is endemic throughout the archipelago. The

prevalence rates reach up to 18 %[20] and are found higher among the poor, for instance in Yogyakarta, where the prevalence in hospital personnel was 17,1%, and 25,2 % in sub-urban areas, due to poorer sanitation, more frequent exposure to the parasite and lessened resistance to infection[21]. Extraintestinal infection mostly occurs in the liver, but amebic liver abscess is not very often found. Bintari (1956)[22] found 35 cases in 26 years, and another 27 cases at autopsy. Nurlela et al (1976)[23] found 15 cases admitted to Cipto Mangunkusumo Hospital in Jakarta from 1971 to 1973. Alisah et al (1980)[24] found 11 cases in Persahabatan Hospital, 8 of which perforating into the pleural cavity of the lung, and one into the abdominal cavity. Three other cases were pulmonary amebiasis. In Yogyakarta only 14 cases with amebic liver abscess were found in a 5 year period[25]. Muljono et al (1983)[26] reported a case of amebic liver abscess perforating into the pleural cavity and lung.

Medication with metronidazole has obtained good results in intestinal as well as in extraintestinal amebiasis.

The diagnosis of acute intestinal amebiasis in our laboratory is made by direct stool examination. Extraintestinal amebiasis is diagnosed by the immuno-diffusion test, which requires 2 days to provide results and which is not capable to differentiate acute infection from an infection in the past. A more accurate immunodiagnosis could be made by demonstrating antigens from the parasite. One approach to this would be the use of monoclonal antibodies to detect antigens in stools, serum or liver aspirates[27].

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QUESTIONS AND ANSWERS :

1. Question: Do you treat patients with chorioretinitis, when IgG for Toxoplasma gondii is positive but IgM negative ?

   Answer : If the IgM is negative, but there are clinical symptoms and the IgG titer is very high or there is a rising titer of IgG, I think the patient must be treated.