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PARASITIC DISEASES AND PSYCHIATRIC ILLNESS*

MITCHELL G. WEISS, M.D., PH.D.¹

Distinguishing parasitic diseases from other infections and tropical medical disorders based on microbiological classification is a matter of convenience. Organic brain syndromes are associated with both protozoan and helminthic infections; side-effects of drugs commonly used to treat parasitoses may impair mood and cause anxiety, agitation or psychosis. Emotional states may in turn affect the experience of medical illness. Psychiatrically significant features of medical illness are determined both by pathophysiology and by the personal and social context in which they occur. Many factors affect mental health in the tropics where the synergy of infection, emotional strengths, vulnerabilities, social supports and stressors is critical. This review discusses parasitic diseases of psychiatric interest by virtue of their effects on thinking, mood and behaviour; and it distinguishes issues that apply mainly to indigenous populations and visitors to endemic areas. In some paradoxical instances the psychiatric influence of parasitic diseases does not require infection; the review concludes by considering the prime example, delusions of parasitosis, which is a primary psychiatric disorder.

The squalor, malnutrition and routine adversity of life in slums and impoverished rural areas where parasitic illness is widespread impede the development of health services and limit their impact. Catastrophic childhood illnesses, primarily infections, account for a greater proportion of the morbidity seen in pediatric neurology in developing countries compared with birth defects in industrialized countries (1). In attempts to explain characteristic features of psychiatric disorders in sub-Saharan Africa, some clinicians argue that through subtle effects on the central nervous system, medical illness, especially malnutrition and malaria, interacts with cultural influences and together explain distinctive features of psychopathology (2).

Social conditions may also facilitate the maintenance and spread of many diseases and enhance their emotional burden. Where they exist, famine, political instability and civil war devastate the local ecology and the health system and they also constitute an additional burden of psychological stress. The poor performance of government-sponsored resettlement

programs in Ethiopia provides a recent example of the adverse effects of uprooting on health (3). The degeneration of health services from 1983 to 1987 in Nicaragua, the resurgence of malaria and other diseases and the prevalence of post-traumatic stress syndrome among refugees fleeing the conflict show the impact of civil war on physical and mental health.

Adjustment of Residents from Abroad

Medical disease, temperament and both social and environmental stressors may complicate the emotional adjustment of visitors to the tropics and long term residents from abroad. Attention to mental health should complement routine advice about recommended vaccinations, malarial prophylaxis and the use of immune globulin to prepare long term travellers for the stressors they are likely to encounter and to promote effective coping strategies. Depression and burnout among some specialized groups, like volunteers and missionaries, may be complicated by ideas that such feelings are inappropriate (4).

T. Rowland Hill coined the term "tropical neurasthenia" in 1943 to describe a syndrome affecting Europeans admitted to a tropical hospital. The syndrome was characterized by restlessness, irritability, poor concentration and fatigability. Although recognizing it was not a fashionable diagnosis, its clarity was irresistible. Picturesque labels had previously described the condition locally as "Punjab head", "Bengal head", "furor tropicus", and "West Coast memory." Hill argued that tropical neurasthenia was a greater source of disability among the British colonials than tropical diseases, although they were related. Among the 50 patients who had the condition he studied, about ten percent had endured repeated bouts of malaria and feared it would persist as long as they remained in the tropics. He attributed symptoms among another 12% to the debilitated state associated with malarial cachexia.

Other military medical officers have maintained interest in the relationship between particular tropical diseases and mental health. During World War II the incidence of organic psychosis associated with malaria increased among British troops during the monsoon, and treatment of anemia, splenomegaly and helminthiases relieved psychiatric symptoms (5). Among the Indian troops, chronic malaria, amebic dysentery and hookworm infection were commonly associated with complaints of weakness, dizziness, vague aches and pains, but less frequently with psychotic symptoms (6).

Stigma of Parasitism in Nonendemic Regions

Where they are a rarity, parasitic infections may be more highly stigmatized. The social meaning of a socially

*Manuscript received September 1993.

¹Associate Professor of Psychiatry, Culture, Community, and Health Studies, University of Toronto; and Department of Psychiatry, The Toronto Hospital, Toronto, Ontario.

Address reprint requests to: Dr. Mitchell Weiss, Clarke Institute, 250 College Street, Toronto, Ontario M5T 1R8

unacceptable illness, like being infected with worms, is frequently more troubling than the medical risk of the particular helminthiasis to which the label refers. Uninformed medical personnel may unwittingly magnify the risk of contagion and reinforce associated stigma by unnecessarily isolating such patients and requesting inappropriate precautions in the course of clinical management (7).

Protozoanoses

Malaria

An extensive literature documents the impact of malaria on mental health and behaviour and its influence on the social history of endemic regions (8). Anderson's (9) detailed monograph on the "malarial psychoses" reviews the literature and presents 201 cases, emphasizing the diversity of psychiatric effects. Turner (10) argues that it was the physical and psychic asthenia resulting from malaria that produced psychosis. A more current analysis (11) of acute organic mental disorders associated with malaria distinguishes 1. neurasthenic syndromes that may be intermittent or associated with fever; 2. delirium and coma; and 3. malarial psychosis, usually with acute paranoid or manic symptoms and depression later. Psychiatric impairment usually reverses completely but among long term residents of endemic areas who have endured many infections, psychopathology, deficits in memory and intelligence, seizures and neurologic symptoms may persist.

Cerebral malaria may be the most significant cause of acute encephalopathy in the tropics (12). Nadeem and Younis (13) found it to be the most common organic mental disorder in the Sudan, a factor among 44% of the 39 patients they studied. Most of these patients were excited, restless and garrulous; nine out of the 17 presented with clear consciousness, which obscured the diagnosis. Distinguishing an organic mental disorder associated with malaria from a primary psychiatric disorder triggered by malaria may be very difficult. Military medical studies of soldiers with the disease during World War II recognized the interplay of organic and psychological determinants of outcome, noting that "misapprehensions and ignorant fears...contribute to a neurotic reaction to their disease" (14). Individual adjustment and situational factors influenced the symptoms and course.

An organic mental disorder associated with malaria may begin with insolent, aggressive behaviour that leads to mania and coma. For example, Chipman et al (15) present the case of a previously well-behaved Chinese-Thai adolescent who became insolent and spat at his parents the day before he was admitted. Intravenous quinine restored his prior pattern of behaviour and personality. Marsden and Bruce-Chwatt (16) caution that when a sudden personality change, disturbed behaviour and confusion lead to imprisonment instead of medical evaluation, the result may be a preventable death in a jail cell from cerebral malaria.

Six cases reported by Gopinathan illustrate atypical features of malarial psychosis (17): no fever and no detectable parasitemia. Wintrob (18) discusses paranoid delusions with respect to cultural beliefs of psychiatric inpatients with

cerebral malaria in Liberia. His discussion also considers the evidence that environmental stress can precipitate an attack of malaria. A recent case report (19) of a 30 year old woman admitted to a psychiatric unit with a diagnosis of atypical depression indicates the complexity of interactions between malaria, personality, life events and depression. Episodes of fatigue and exhaustion without fever, which compelled her to remain in bed for two days at a time, recurred every three to four days. A detailed travel history led to a diagnosis and treatment of malaria and her condition improved. But the depression resolved subsequently only after a course of antidepressant medication.

Travellers to areas with endemic malaria lack immunity and are especially vulnerable to more severe disease when infected. Noncompliance with recommended prophylaxis exposes many to unnecessary risk. A recent study found 41% of travellers under 40 years of age were noncompliant (20), which indicates a need for research to explain why recommendations for prophylaxis are ignored and to determine the consequences. Side-effects of low-dose chloroquine used for prophylaxis are usually not troubling but psychosis is a rare complication (21). Increasing use of mefloquine to treat chloroquine-resistant malaria indicates that psychosis as a side-effect at therapeutic doses may be a problem (22).

Trypanosomiasis

African trypanosomiasis is frequently associated with psychiatric symptoms, especially mania and depression. Irritability, insomnia, mood disturbance and personality changes are typical early signs of the illness, especially among Europeans. The daytime drowsiness of sleeping sickness comes later. Mulligan's (23) treatise on trypanosomiasis warned that one might easily confuse the condition with tropical neurasthenia. A British military medical study (24) in West Africa during the mid-1940s reported that ten percent to 13% of acute mental illnesses were caused by trypanosomiasis and noted that it was difficult to identify trypanosomes in the cerebrospinal fluid of many patients. An acute violent outburst may signal the onset, and the clinical presentation has been confused with primary mania or catatonic excitement.

Emotional lability, confusion, hallucinations and antisocial behaviour are typical mental symptoms in Gambian trypanosomiasis. Irrational, aggressive behaviour may lead to arrest and legal difficulties. As the disease progresses, apathy and lethargy become more prominent. Psychopathology in the Rhodesian type is more likely to be associated with delirium and fever and more likely to be transient. Tooth (25), a psychiatrist who studied trypanosomiasis in the Ivory Coast, argued that because it was so common in endemic parts of West Africa, he advised that acute mental status changes were sufficient justification to begin treatment for trypanosomiasis. However, research weighing the risks and benefits of that recommendation does not support such a policy.

The onset of symptoms in the chronic form, caused by *T. gambiense*, may be especially difficult to recognize among migrants outside of endemic areas. Failure to correctly

identify trypanosomiasis on a blood smear may lead to a mistaken finding of drug resistant malaria (26). A case seen late in its course at the Hospital for Tropical Disease in London, described by Walters (27), illustrates the tragic consequences of diagnostic confusion. A student from Gambia in London was arrested for stealing his landlord's wallet. While on bail he stole a car and drove it to Brighton to find a ship that would take him home. After ECT, which was prescribed for abnormal behaviour after he was sent to prison for stealing the car, he failed to recover consciousness and a craniotomy was performed to resect a suspected frontal lobe tumour. A biopsy of abnormally congested meninges and frontal cortex revealed trypanosomes. Aggressive anti-trypanosomal treatment restored consciousness, but aggressive psychopathic behaviour persisted.

Chagas' Disease

In addition to cardiac and gastrointestinal symptoms, depression may be an important feature of Chagas' disease. Reconsidering accounts of Charles Darwin's mysterious illness after returning from a five-year voyage to South America, a psychiatrist studying the records of Darwin's life speculated that Chagas' disease might explain his symptoms of depression, palpitations, gastric upset and headaches (28). Chagas' encephalitis has also been associated with catatonic symptoms (29).

Amebiasis and Giardiasis

Depression may accompany amebiasis or giardiasis and it may be the symptom that brings a patient for clinical treatment (30). Unusual psychotic symptoms and aggressive behaviour among children with amebiasis and giardiasis have also been reported (31,32). Institutionalized patients with psychiatric illness or mental retardation are at high risk for gastrointestinal parasitoses. Institutionalized children may also be especially vulnerable to neuropsychiatric sequelae of gastrointestinal infection. Although secondary meningoencephalitis associated with *Entamoeba histolytica* may occur, it is distinct from the serious primary meningoencephalitis resulting from other free-living amebas (*Naegleria* spp., *Acanthamoeba* spp. and others).

Because of its side-effects, quinacrine has been replaced by other drugs to treat giardiasis, malaria and other protozoan infections. Anxiety, confusion, agitation, delusions and hallucinations are among the associated neuropsychiatric symptoms associated with quinacrine.

Toxoplasmosis

Psychotic symptoms, seizures and other neurological findings result from cerebral toxoplasmosis, which is typically an opportunistic infection that may accompany HIV encephalitis. EEG findings of focal slowing or sharp wave activity associated with cerebral toxoplasmosis indicate the utility of the electroencephalogram for evaluating treatable components of organic mental disorders among patients with AIDS (33). Congenital toxoplasmosis may cause mental retardation.

Heminthiasis

Filariasis

Complications of three filarial infections are associated with neuropsychiatric symptoms: *Loa loa*, *Wuchereria bancrofti* and *Onchocercus volvulus*. The organic mental disorders that result may present with acute psychotic symptoms or chronic asthenic debility with a range of psychiatric symptoms and variable findings of microfilaria and eosinophilia in cerebrospinal fluid. Psychiatric presentations may be either acute or chronic with a progressive onset. Acute or subacute conditions are marked typically by agitation, assaultiveness and manic or depressive symptoms, which may be accompanied by psychotic delusions and hallucinations. The chronic illness resembles accounts of tropical neurasthenia but fails to remit after leaving the tropics. Symptoms include personality change, impaired intellectual functioning, apathy, hypersomnia and disturbed mood, which is usually depressed. Case reports, including an interesting first person account of the illness by a teacher, Case 4 of Kenney and Hewitt (34), emphasize irritability.

The response to treatment of bancroftian filariasis and onchocerciasis with diethylcarbamazine may be dramatic, both for the acute psychoses and the chronic debilitating illness. Surgical removal of *Loa loa* parasites may also clear psychiatric symptoms which are prominent in atypical cases. Effects on the central nervous system rarely result from direct invasion of the central nervous system but more commonly from neurotoxic effects of an allergic reaction. Initiating treatment with diethylcarbamazine, which produces a massive release of filarial antigen, may also trigger or exacerbate neuropsychiatric symptoms.

Psychological, social and cultural background strongly influence the clinical impact of bancroftian filariasis and the psychiatric significance of the disease for indigenous populations and visitors to endemic regions who become infected. Attitudes of peers to the disease, personality, psychological adjustment and local illness-related beliefs affect the meaning of infection and strategies to cope with it and they determine whether depression or anxiety may result independent of toxic effects on the central nervous system. Psychological reactions to elephantiasis and scrotal edema arising from the disease impose a serious emotional burden which may be interpreted according to local cultural idioms. For example, A.N. Chowdhury (35) reported a relationship between a culture-bound psychiatric syndrome, koro, and scrotal edema due to filariasis. Koro is a syndrome characterized by intense anxiety and fear that one's penis is contracting, that it will completely involute into the abdomen, and that this event will be fatal. Comparing 162 men with koro to an equal number of controls in a district of West Bengal, India where an outbreak occurred, Chowdhury (35) found the koro group included more men than the control group with scrotal edema from filariasis. This association between koro and scrotal filariasis suggests a link between the parasitic disease, its psychological impact and a culturally defined idiom of distress.

Psychological reactions of temporary residents to the fear of disfiguring disease reflect the personal and cultural values they bring with them. Military medical reports during World War II from Samoa and other Pacific islands where bancroftian filariasis was endemic emphasized the psychological significance of elephantiasis and lymphangitic scrotal edema. Grotesque deformities affecting large portions of the local population generated predictable fears about the long term effects of infection on sexual functioning and social acceptance among the soldiers who contracted the disease. Clinical management emphasized health education and counselling to relieve depression and allay anxiety by dispelling hypochondriacal fears of elephantiasis, impotence and sterility. Because they were relatively short term visitors, such sequelae were not a serious risk for the soldiers. Among endemic populations, however, cultural meanings of disfiguring symptoms and effects to cope with them require further study.

Cysticercosis

Neurocysticercosis results from fecal-oral contamination and ingesting the eggs of the pork tapeworm, *Taenia solium*. Mass effects and an inflammatory reaction, which ensues when larvae in multiple brain cysts begin to die, cause most damage. Focal seizures and hydrocephalus with neuropsychiatric symptoms are common presentations, but organic mental disorders with visual, olfactory and auditory hallucinations may accompany a variety of other mental status changes, incontinence and other neurologic symptoms. Cysticercosis is most common in South America, Eastern Europe, Asia and South Africa. In Santiago, Chile mental deterioration, which is frequently associated with hydrocephalus, was the main clinical feature for 20% of a sample of 40 patients studied by Torrealba et al (36). Treatment with praziquantel effectively reduces cysts but an inflammatory response to dying organisms typically causes headache, fever, seizures, meningismus and intracranial hypertension.

In atypical cases, psychiatric symptoms may be the main clinical feature that initially compels the patient to seek psychiatric treatment. Psychopathology in four out of the 17 cases Obrador (37) reported from neurosurgical practice in Mexico required inpatient psychiatric hospitalization. Case reports (38) emphasize acute psychosis with paranoid delusions and assaultive behaviour. Dementia may also result from neurocysticercosis (39).

Clinical experience with British soldiers in India underscored the diversity of psychiatric symptoms of neurocysticercosis (40). Dixon and Lipscomb (41) made a detailed study from case records of the symptomatology of 450 patients, mostly ex-servicemen who had served in India. Nine percent had prominent symptoms of a mental disorder. Mental deterioration was the most common finding (74%), usually associated with epilepsy. Two percent had symptoms of an affective disorder, and because of the absence of neurologic findings, it was not clear to the investigators whether psychopathology was incidental or a result of cysticercosis. Two out of five patients with depression

committed suicide. Three cases had a psychosis resembling schizophrenia.

Trichinosis

Severe cases of trichinosis may simulate meningitis, encephalitis and psychiatric illness during the larval migration period in the second week of infection. Psychopathology was prominent in four out of 20 cases in the first documented report of the disease in Hong Kong (42). One case had catatonic posturing, standing at attention for two hours; another was depressed; a third patient was delusional, believing he was in prison; and the last was preoccupied with the idea that worms were in his head. Barr (43) discusses a case in which a paranoid reaction required heavy sedation, but high fever and neurological signs associated with the heavy infections that invade the central nervous system make confusion with a primary psychiatric illness unlikely.

Angiostrongyliasis Cantonensis

Angiostrongylis cantonensis, the rat lung worm of Southeast Asia and some Pacific Islands, is a cause of eosinophilic meningitis. Severe infections may only rarely be associated with agitation, confusion and hallucinations (44). A discussion (45) of two mental patients with eosinophilic meningitis who died in Hawaii in 1959 raises the question of whether or not this disease may contribute to psychiatric symptomatology in endemic areas. But the contribution does not appear to be significant.

Schistosomiasis

Chronic infection with *Schistosoma mansoni* may be associated with apathy, inactivity and a lack of curiosity (46), but cerebral involvement occurs more commonly from infection with *Schistosoma japonica*. Psychosis is recognized as a type of cerebral schistosomiasis. Although there are no reports in English, Ariizumi (47) refers to accounts in the Japanese medical literature attributing psychotic symptoms to toxic metabolites of the schistosomes, cirrhosis and degenerative changes in the brain.

Other Helminthiases

Recognizing hookworm disease as a cause of apathy, lethargy and emaciation, the Rockefeller Sanitary Commission was founded in 1909 to address both clinical and social problems associated with the disease in a major program of hygiene and preventive medicine. Palpitations and exertional dyspnea resulting from anemia that follows from ancylostomiasis may also be especially troubling among some groups. For example, in East Africa, these symptoms focus attention on culturally shaped concerns about the heart.

Gastrointestinal parasites are associated with depression that may sometimes be severe. A case report (48) from Georgia discusses the association of strongyloidiasis and symptoms of major depression with persisting suicidal ideation. The patient's response to imipramine was incomplete but depression and gastrointestinal symptoms cleared completely after diagnosing the infection and treating it with a course of thiabendazole.

Delusions of Parasitosis

Unlike the parasitoses surveyed in this review, this section concerns itself with a psychiatric condition in which parasitic disease is central but infection conspicuously absent. Delusions of parasitosis, which some authors (49) classify as a type of monosymptomatic hypochondriacal psychosis, refers to an unshakable conviction that one is infected by parasites, bugs or worms despite contradictory findings from an appropriate clinical evaluation. A variant of the matchbox sign, which refers to patients who come for treatment bringing a matchbox filled with debris that allegedly includes the parasite, signals the diagnosis (50). Poor judgment may fuel zealous efforts to be rid of the parasites by fumigation or an attempt to burn them out, which can make such patients dangerous (51).

Case reports come primarily from North America, Great Britain, Germany and Austria. The absence of reports of the condition elsewhere indicates that the specificity of this particular delusion may be a culture-bound phenomenon, dependent on cultural meanings of parasites, bugs, and worms. Most of these patients seek help from dermatologists or traveller's medical clinics, and they typically resist referral to a psychiatrist. Either a particular delusion or a hypochondriacal preoccupation is a cardinal feature of this condition, but the clinical context may vary considerably, both in quality and severity, ranging from a pervasive psychotic disorder to little more than an overvalued idea. The delusion may be shared among two (*folie-à-deux*) or more persons (52). Delusional patients usually refer to infestations of the skin. More hypochondriacal patients may focus on a range of nonspecific bowel symptoms and fatigability attributed to an imaginary amebic infection. Distinguishing a delusion from a medical disease that is difficult to diagnose may present a formidable challenge and the *Lancet* sagely advises clinicians to check the matchbox for real parasites.

According to the current American manual of psychiatric diagnosis (53), the typical case description fits the category of delusional disorder. However, other diagnoses may be more appropriate including schizophrenia, a mood disorder, hypochondriasis, factitious disorder with physical symptoms or organic mental disorder, depending on the particular clinical circumstances. Organic conditions associated with delusions of parasitosis include ischemic cerebrovascular disease, structural brain lesions, metabolic and endocrine disorders and substance abuse with cocaine, amphetamines, alcohol and other drugs.

Over the past decade pimozide, a potent neuroleptic, has become the accepted treatment of choice. Adding an antidepressant for patients who are also depressed may improve the response rate. Establishing an empathic supportive treatment alliance is essential, and for some patients this alone may be the critical intervention. For others with a stormy history of conflict with clinicians, prominent in many case reports, this alliance makes it possible for them to accept pharmacological treatment.

Conclusion

Clinicians who treat parasitic diseases and mental health professionals should assess the risk of infection and consider atypical psychiatric presentations of parasitic diseases. They should also be familiar with the emotional burden and social context of these disorders and related psychiatric conditions in which symptoms may refer to parasitism.

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Résumé

Distinguer les maladies parasitaires d'autres infections et maladies tropicales en se fondant sur la classification microbiologique est une question de commodité. Les infections à protozoaires, aussi bien que les helminthiases, s'accompagnent de syndromes cérébraux organiques; les effets secondaires des médicaments habituellement prescrits pour traiter les parasitoses sont susceptibles d'altérer l'humeur et de provoquer de l'anxiété, de l'agitation ou une psychose. Ces états émotifs peuvent, à leur tour, influencer sur la manifestation de la maladie organique. Les caractéristiques de cette dernière ayant de l'importance d'un point de vue psychiatrique dépendent à la fois de la pathophysiologie et du contexte personnel et social dans lequel elles se manifestent. Sous les tropiques, où la synergie entre l'infection, la stabilité émotionnelle, la vulnérabilité, le soutien social et les facteurs de stress joue un rôle critique, de nombreux paramètres ont une incidence sur la santé mentale. L'étude porte sur les maladies parasitaires qui présentent un intérêt du point de vue psychiatrique en raison de leurs effets sur la pensée, l'humeur et le comportement, et fait la distinction entre les problèmes qui touchent plus particulièrement les populations autochtones, d'une part, et les visiteurs des zones endémiques, d'autre part. Dans certains cas paradoxaux, les effets psychiques des maladies parasitaires se manifestent en l'absence d'infection; pour conclure, les auteurs examinent l'exemple par excellence, à savoir le délire de parasitose, considéré comme un trouble mental primaire.