ABSTRACTS

CELLULAR IMMUNE RESPONSE TO PARASITIC INFECTIONS

SAVANAT THARAVANIJ

Department of Microbiology and Immunology, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand.

Cellular immune responses to parasitic infections could be conveniently discussed in 2 categories namely delayed type hypersensitivity (cell-mediated immunity) and antibody-dependent cell-mediated immune reaction.

Cell mediated immunity: Antigens from invading parasites interact with the receptor(IgT?) on the surface of T cells triggering them to undergo blast transformation and proliferation to become eventually "activated T cells" (sensitised T cells, specifically sensitised lymphocytes). On the subsequent encounter with the antigen the activated T cells release soluble mediators which have a multitude of bilogical activities. Among these are 'transfer'factor and 'lymphokines'. Transfer factor is a low molecular weight substance (10,000 daltons) and is claimed to be able to convert naive lymphocyte to an antigen-sensitive state. Lymphokines, in contrast to transfer factor, are non-specific effectors having effects on macrophages, polymorphonuclear leucocytes, lymphocytes, cultured cells and blood vessels.

Cell-mediated immunity has been demonstrated in many protozoal infections (amoebiasis, malaria, leishmaniasis, toxoplasmosis), in nematode infections (*Nippostrongylus brasiliensis* infection, trichinosis and angiostrongyliasis) and in trematode infection (schistosomiasis). The occurrence of CMI in parasitic infections may have at least 2 functions, protective immunity and immunologically mediated damage of the host's tissue.

Protective immunity: Protection afforded by CMI has been demonstrated by passive transfer experiment of lymphoid cells from immune animals with leishmaniasis, American trypanosomiasis, trichinosis, *Nippostrongylus brasiliensis* infection and fascioliasis hepatica whereas passive transfer of immune sera had no protective effect. Procedures known to be effective in reducing T-cell population, i.e. neonatal thymectomy, administration of anti-thymocyte serum had profound suppressive effect to resistance. *In vitro* tests for CMI were, in general, positive. In guinea pigs infected with *Leishmania enriettii* and in mice infected with *L. tropical* infections, their macrophages obtained during active stage of infection inhibited multiplication and even killed intracellular leishmania, Macrophages from convalescent animals were unable to kill the leishmania, but could kill the listeria in a non-specific manner.

Immunological mediated damage of the host: Damage of the host tissue by cell mediated immune reaction has been well documented in schistosomiasis, the granuloma formation in which is due to the host reaction to the soluble egg antigen. The evidence in support of the above conclusion are:-(i) Mice previously sensitised with eggs by intraperitoneal inoculation and received intravenous infection of eggs developed granuloma in the lung in 8 days, whereas the same manoeuvre in normal mice produced granuloma in 16 days: and (ii) the ability to produce enhanced granuloma formation could be transferred by sensitised lymphoid cells.

Antibody-dependent cell mediated immune reaction: This reaction has been documented in schistosomiasis, in which it was shown that the schistosomulae exposed to the immune serum *in vitro* were rapidly killed in the presence of added eosinophils or neutrophils, but the effect was more marked in the presence of the eosinophils. Addition of the lymphocytes had no effect.

NUTRITIONAL FACTORS IN THE PATHOGENESIS OF PARASITIC INFECTIONS

FRANK P. SCHELP

Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand.

A parasitic infection, as any other infection, causes disease not only by the infective agent, but the activity of this agent depends also on the host's characteristics and environmental factors. A poor nutritional status caused by unfavourable socio-economic conditions alters the resistance of the host to infection and the infection decrease itself the nutritional status of the host. This starts a vicious circle. Especially in those cases where the parasite is causing generalized infection like in malaria, but also in amoebic liver abscess and schistosomiasis the infection is favoured by malnutrition and also deteriorates the host nutritional status.

Reduction of food intake, impaired digestion and malabsorption are due to those symptoms of infection as there are anorexia, vomiting, increased peristalsis. Epithelium, blood, muscle and liver tissue are lost depending on the localization and pathogenesis of the parasitic infection. During infections with helminths the absorption of protein is decreased possibly caused by enzymes excreted by the worms, which inhibit the action of pepsin and trypsin in the gut. In addition there is a loss of nitrogen, electrolytes and vitamins from the host.

For the host's intermediary metabolism infection is causing nutrient over-utilization, nutrient sequestration and nutrient diversion. In moderate and severe forms of protein-energy malnutrition there is a decrease in the number of immune cells in the adequate tissue, the antibody synthesis is impaired and the B- and T-cell immunocyte function is altered.

EOSINOPHILIC MENINGITIS SYNDROME ASSOCIATED WITH ANGIOSTRONGYLIASIS AND GNATHOSTOMIASIS

MANOON BHAIBULAYA

Department of Helminthology, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand.

Eosinophilic meningitis caused either by *Angiostrongylus cantonensis* or *Gnathostoma spinigerum* is

regarded as public health problem in Asian countries, the Pacific Islands and Australia. *A. cantonensis*, a metastrongylid nematode, normally lives in the pulmonary arteries and right side of heart of various kinds of rodents and inhabit in many species of snails and slugs as its intermediate host. In the rodent definitive host, this nematode exhibits specific migratory pattern. After being swallowed by the definitive host, the third-stage larvae penetrate the gastrointestinal tract. The majority of them get into the blood circulation and few into the lymphatic vessels. After reaching the left side of heart the larvae disperse to various organs but approximately 45% reach the brain. From the brain, after becoming young adults, they migrate further to the pulmonary arteries. In man the migratory route probably is similar to that of the rodent. Adults *A. cantonensis* have been found in two human cases, one from Taiwan and another from Thailand.

Gn. spinigerum is a spirurid nematode found in the stomach of cats and dogs. Cyclops and various kinds of fresh-water fish serve as the first and second intermediate hosts respectively. In the cat, *Gn. spinigerum* exhibits a rather specific migratory pattern. After being swallowed and by direct penetration,the infective larvae in the muscular tissue of fresh-water fish pass through the gastrointestinal wall and reach the liver. They spend a few months in the liver and then migrate to the muscular tissue. Two to 3 weeks after reaching the muscular tissue they migrate further to the stomach, the final site. Growth and development have been observed while the larvae are in the liver and muscular tissue. In man it is believed that the larvae pass through the liver before wandering to various organs and tissues.

CLINICAL MANIFESTATIONS OF EOSINOPHILIC MENINGITIS

SOMPONE PUNYAGUPTA

Vichaiyut Clinic, Setsiri Road, Bangkok, Thailand.

Eosinophilic meningitis, a neurological disease characterized by eosinophilic pleocytosis has been found to be prevalent in many areas in the Pacific and Southeast Asia. *Angiostrongylus cantonensis* and *Gnathostoma spinigerum* are proved to be the causative agents. We have described the clinical syndrome, the epidemiology, the pathogenesis and pathology of the disease. The presentation summarizes the clinical features of the two clinical entities caused by the two nematodes based on the data from 646 clinical cases as well as the review of 27 proven cases of *A. cantonensis* infection and 6 proven cases of *G. spinigerum* infection. Eosinophilic meningitis caused by the two parasities can be differentiated with reasonably certainty according to the clinical features.

In *A. cantonensis* infection, the disease varies from asymptomatic to acute neurological disorders which may lead to fatal outcome. Fatality rate varies from no fatality out of several hundred cases from the South Pacific, one out of 484 cases from Thailand and 4 out of 125 cases from Taiwan. Acute severe headache, paraesthesia, sensorium impairment, cranial nerves II, VI and VII involvement, symptoms related to the increase in intracranial pressure and signs of meningeal irritation are the main features. Psychosis was observed as a leading symptom in some cases. Fever is insignificant. Generalized weakness of the extremities may be rarely observed yet one case of cord lesion has been reported. Cerebral haemorrhage is very unusal. Early gastrointestinal symptoms of vomiting and abdominal pain associated with allergic rashes were noted in some patients. In 2 cases, late pulmonary symptoms verified by the radiological findings and post mortem findings of *A. cantonensis* in the lungs are most interesting. Worms have been recovered from anterior or posterior chambers of the eyes following the CNS involvement. We have suggested that *A. cantonensis* may be responsible for a significant percentage of blindness among the Thais. *A. cantonensis* larvae have also been recovered form the spinal fluids in many instances. The incubation perior ranged from 3-36 days with average of 16 days among the mild cases and 1-20 days with average of 8 days in the more severe proven cases.

In contrast, symptoms of severe nerve root pain preceding the paralysis of the extremities suggesting the spinal cord lesion and the cerebral haemorrhages with hemiplegia and comatose are the main features in eosinophilic myeloencephalitis caused by *G. spinigerum*. The sequences of the neurological symptoms corresponded well with the neuropathological findings. Bloody and xanthochromic spital fluids are characteristic. Eye lids swelling may be observed before or after the CNS symptoms and the worm has been recovered. Fatality rate is much higher, up to 25 per cent. Incubation period is unknown. Those who recovered, experienced permanent residual neurological defects. The usual migratory cutaneous swelling of gnathostomiasis is seldomly seen. It is estimated that *G. spinigerum* is responsible for about 20 per cent as a cause of intracranial haemorrhages among the Thais.

PATHOLOGY OF GNATHOSTOMIASIS

NIDHI CHONGCHITNANT

Department of Pathology,
Faculty of Medicine, Ramathibodi Hospital,
Bangkok, Thailand.

Pathologic changes produced by the gnathostome result mainly from damage to the host tissues by their movement and their spines. The basic changes consist of inflammation, inflammatory mass or haemorrhage. Various clinical manifestations were briefly reviewed. Two examples of the lesions in the central nervous system were presented to show the gross pathology which consists of the presence of the parasite, the tract itself which is approximately 1 mm in diameter and haemorrhage either intracerebral or subarachnoid. Histopathologic changes consist of necrosis of neural tissue, inflammation with eosinophilic perivascular cuffing and demyelinization. These unique characteristic changes seem to be diagnostic even though the parasite could not be found.

PATHOLOGY OF HUMAN MALARIA

EMEKA G. OLISA

Department of Pathology, University of Jos, Jos, Nigeria.

Human malaria is emphatically an infection of the erythrocytes by malaria parasite. Some of the basic principles underlining the pathology of malaria includes, the multiplication of parasites and subsequent destruction of erythrocytes, the production of haemozoin from haemoglobin, (malaria pigment) the so called "plugging" of the small blood vessels particularly in the brain with infected red blood cells. Pathological changes in the various organs which include the brain, spleen, liver, kidneys and bone marrow were also described. The identification of pigments in the various organs remains a common specific factor associated with malaria infection.

IMMUNOPATHOLOGIC MECHANISMS OF MALARIA

R. OWOR

Department of Pathology, Medical School, Makerere University, Kampala, Uganda.

Evidence available from clinical, pathological and experimental studies indicate that malaria can produce different lesions through immunopathologic mechanisms. The main clinical syndromes expressed in this manner can be classified into acute and chronic types.

Acute: In cerebral malaria there is evidence to suggest that petechial haemorrhages are due to immunopathologic reaction. This is based on the observation that cerebral malaria is rarely seen in children with protein - energy malnutrition. It has been observed in experimental animals that the cerebral haemorrhage depends on the immune response to the parasite. Cerebral haemorrhage does not occur in the hamster if the immune response is suppressed by neonatal thymectomy or administration of antilymphocyte serum. Acute rena llesions have besen observed in patients who about 2 weeks after falciparum infection develop transient nephrotic syndrome. This is probably the result of the deposition of immune complexes on the glomerular basement membrane and mesangium. Anaemia which is out of proportion to the degree of parasitaemia is well recognized. There are probably several mechanisms involved and one of them may be the part played by circulating antigen - antibody complexes and drug induced hypersensitivity. Experimental studies have shown that antigen - antibody complexes bind to red cells and this may cause haemolysis.

Chronic: Nephrotic syndrome associated with *P. malariae* infection and chronic glomerular lesions is well recognized. Using immunofluorescence it has been found that IgG, IgM and complement are attached to glomerular basement membrane giving granular pattern. However, *P. malariae* antigen is found in only about a quarter of the patients. Tropical splenomegaly syndrome(TSS) is characterized by enlarged spleen, lymphocytosis in the liver sinusoids, marrow and peripheral blood. There is a high level of a variety of IgM antibodies including malarial antibodies. There is yet no clear explanation for this high level of IgM. It has been suggested that Burkitt's lymphoma may be the result of E.B. virus acting on the lymphoreticular system already influenced by malarial infection. The evidence is however circumstantial.

In discussing these points it is apparent that there are still many questions which need to be answered in regard to the immunopathologic mechanisms of malaria.

PROLIFERATIVE GLOMERULONEPHRITIS ASSOCIATED WITH *PLASMODIUM FALCIPARUM* INFECTION: LIGHT, IMMUNOFLUORESCENCE AND ELECTRON MICROSCOPIC STUDY

VIJITR BOONPUCKNAVIG, SOMNATE BOONPUCKNAVIG* and NATTH BHAMARAPRAVATI

Department of Pathology, Faculty of Medicine, Ramathibodi Hospital and* Department of Pathobiology, Faculty of Science, Mahidol University, Bangkok, Thailand.

Renal tissue was obtained from ten patients by percutaneous needle biopsy and from another patient at the time of autopsy. The eleven patients had acute *Plasmodium falciparum* infection and showed varying degrees of urinary abnormality. Immunoglobulins (IgG, IgM and B 1 C were localized in mesangial areas and extending into some contiguous loop walls of all but one case. Malarial antigen was detectable by fluorescent antibody technique in one biopsy specimen and in the autopsied material. Eluate of immunoglobulin from the autopsy kidney shows strong antimalarial property. Electron dense fibrillar material which was considered to be fibrin was occasionally seen in the spaces forming by endothelial cytofolds and mesangial extracellular spaces. It was concluded that immune complex nephritis may occur in acute *P. falciparum* malaria. The immune complex is cleared from the glomerular structures relatively fast and the glomerular injury is reversible in contrast to immune complex nephritis in *P. malariae*.

FOCAL IMMUNE COMPLEX GLOMERULONEPHRITIS IN MICE WITH CHRONIC *PLASMODIUM BERGHEI* INFECTION

VIJITR BOONPUCKNAVIG, SOMNATE BOONPUCKNAVIG* and NATTH BHAMARAPRAVATI

Department of Pathology, Faculty of Medicine, Ramathibodi Hospital and *Department of Pathobiology, Faculty of Science, Mahidol University, Bangkok, Thailand.

Twenty one male Swiss albino mice were injected intraperitoneally with 2×10^5 *Plasmodium berghei berghei*. Twenty four mice were used as a non-infected control group. On the tenth day after infection three mice were killed and the remainder were treated with chloroquine(0.025%) by oral route. The dosage was subsequently adjusted to keep the parasitaemia at a level below $500/10^4$ RBC. Eighteen of the controls received the same chloroquine dosage. Parasite counts

on blood smears were performed dialy. Three infected mice, three chloroquine treated non-infected mice and one normal control were sacrificed monthly from 1st to 6th month.

Diffuse proliferative glomerulonephritis was seen from day 10th of infection up to two months after treatment. Granular deposits of immune complex were seen in all glomeruli. At the end of third month and from then on when all experimental mice were on hyperimmune stage the kidneys show the histological and immunopathological pattern of focal glomerulonephritis.

GLOMERULAR PATHOLOGY OF *P. malariae*

V. HOUBA

WHO Immunology Research and Training Centre, Nairobi, Kenya.

Nephropathies associated with tropical parasitic infections have been described in experimental animals and in man and many of these are compatible with the depositing of immune complexes in glomerular capillary walls. The most convincing evidence for immune-complex type of renal lesions has been established in malaria.

Two main types of lesions have been described:

(a) Acute, transient, reversible lesions typical of *P. berghei* infections in rodents, *P. cynomolgi* in rhesus monkeys and *P. falciparum* in Aotus monkeys and man. These lesions develop with mild clinical symptoms 10-14 days after infections and depositions of immunoglobulins, complement and antigens are detectable in glomeruli by immunofluorescence. The lesions respond to antimalarials.

(b) Chronic progressive lesions characteristic of quartan malaria in animals and man; these develop slowly into a chronic stage with persistent proteinuria and gradually deteriorating renal function and hypertension. Depositions of immunoglobulins, complement and in some cases antigens in glomerular capillaly walls could be detected at the onset of the disease as well as during chronic stage. Antimalarial therapy clears parasitaemia but has no effect on renal lesions. Immunological and immunochemical findings have confirmed that these lesions are of the immune-complex type and associated with malaria infection. Correlation of immunofluorescence findings with clinical data and the response to treatment with corticosteroids indicates that fine granular pattern of immunoglobulin depositions in glomerular capillaries may be more progressive than the coarse granular pattern. Detailed analysis of the differences between patterns were discussed, together with electron-microscope findings.

Although a lot of new data have been found, several important questions remain to be solved, such as; How does the lesion start?, Why does quartan malaria seem to be implicated in the aetiology of the chronic progressive lesions? What factors are responsible for the perpetuation?

MOLECULAR AND CELLULAR PATHOLOGY OF COMMON THALASSEMIC DISEASES OF SOUTHEAST ASIA

PRAWASE WASI

Division of Hematology, Department of Medicine, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok, Thailand.

In Southeast Asia haemoglobin (Hb) E is highly prevalent reaching an incidence of 50% at the junction area of Laos, Cambodia and Thailand. Thalassemia both α and β varieties and their subtypes and Hb, Constant Spring are also prevalent.

These abnormal genes in different combinations lead to a spectrum of over 60 thalassemia syndromes, ranging from asymptomatic forms to the lethal Hb Bart's hydrops foetalis.

Pathophysiology of thalassemia stems from unbalanced globin chain synthesis. Normally in Hb A ($\alpha_2\beta_2$) the α/β synthetic ratio is close to unity. In α-Thalassemia defective β-chain synthesis results in excess β-chain and vice versa in β-thalassemia. Deposition of precipitated excess globin chains causes red cell membrance damage, leading to early cell death. Iron released in the red cells due to defective globin synthesis also causes aberration in the oxidation reduction process. Resultant hemolysis and iron overload lead to organ pathology of many systems.

Defective globin chain synthesis occurs from decreased quality of mRNA. It is now possible to isolate α- and β- mRNA specifically. With reverse transeriptase it is now possible to synthesize cDNA (Genes) from human mRNA for α and β-chains. By probing with specific cDNA it is now possible to measure the number of globin genes directly.

We are thus now in a better position to follow pathology from the molecular level through cellular pathology to organ pathology, expanding to population pathology.

PATHOLOGY OF DENGUE HAEMORRHAGIC FEVER

NATTH BHAMARAPRAVATI

Department of Pathology, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand.

Dengue haemorrhagic fever (DHF) represents an unusual host response to dengue viral infection. This particular type of dengue for some unknown reasons, occur in children and occasionally in adolescents in countries of Southeast Asia. Fatalities among DHF are the usual outcome in cases manifested as dengue shock syndrome, a severe form of dengue haemorrhagic fever.

The pathological findings in fatal cases are: (1) Vascular changes which are characterized by focal haemorrhages around venules and capillaries, and leakage of plasma into interstitial tissue and serous cavities. The fluid in the serous cavities is rich in small molecular weight protein while in the circulation there is

hypoproteinemia and hypovolemia. There are non-specific morphological findings of the vessels in both light and ultra structural levels. (2) The livers show changes similar to yellow fever. (3) The hemopoietic and reticuloendothelial system show a marked turnover of lymphocytes manifested morphologically by lymphocytic phagocytosis in spleen and lymph nodes. There is also an increase number of transformed lymphocytes, B lymphocytes, plasma cells and monocytes in the peripheral blood, and in the tissue. (4) The kidneys show transient immune complex glomerulonephritis which usually clears up in about 3 weeks should the patient recover from shock. (5) Skin rashes have been shown to be related to immune complex deposit in the terminal microcirculatory beds. The pathogenesis of the disease remains unclear. Because most of the cases occur during the secondary infection, it was believed by some that the DHF syndrome is manifested by host immune response to the infection. One type of dengue virus infection followed by another type at appropriate interval may result in severe disease. Massive complement activation through the classical pathway has been demonstrated. This was suggested to result in the formation of a large amount of anaphylotoxin (C_3a and C_5a), which could act as potent vascular mediator. Other system of mediators such as kinin and fibrinopeptide do not appear to be of importance. What activates the complement is still not clear. Some cases of DHF occur in primary infection and it was postulated that there may be a direct cell injury caused by the virus or viral products which somehow could activate the complement system. Since the disease is still prevalent in Southeast Asia, it seems important to try to resolve this question on the pathogenesis which would have important bearing on the application of immunoprophylaxis or immunotherapy in the future.

OPISTHORCHIASIS IN THAILAND

CHAMLONG HARINASUTA

Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand.

Liver fluke infection in Thailand is caused by *Opisthorchis viverrini*. The flukes are found to reside in the biliary passages of man and animals. The infection is prevalent mostly in the northeastern and northern parts of the country. It has been estimated that about 4 million of Thai people suffered from this infection.

The adult worm is about 5.5 - 9.5 mm in length and 0.8 - 1.7 mm in width, and the egg is about 16x29 microns in size. An adult worm produces about 1,100 - 2,400 eggs per day which are discharged into the bile ducts and evacuated in the host's faeces.

The first intermediate snail host has been identified as *Bithynia goniomphalus, B. funniculata* and *B. laevis* where the cercariae develop. However, the infection rate in the snail in the endemic area was rather low, being about 0.05%. The second intermediate host has been found to be cyprinoid fishes, the most important species being *Cyclocheilicthus siaja, Hampala dispar* and *Puntius orphoides* where the mature infective metacercariae are recovered. The infection rate in the fish was found to be about 30-70% in endemic areas of opisthorchiasis.

Three main factors responsible for high prevalence and propagation of infection include (1) Habit of consuming raw fish food which is common practice among the local people; (2) Unavailability of latrines and the habit of defaecating on the ground in the bushes near the houses and poor hygiene of the villagers resulting in pollution of the water in the adjacent lakes and water-beds by faeces containing *Opisthorchis* eggs, thus facilitating the life cycle of the parasite, and (3) Prevalence of the first and the second intermediate hosts, i.e. *Bithynia* snails and cyprinoid fishes where cercariae and metacercariae of the parasite develop respectively. When man or animals eat infected fish and acquire infection, the life cycle of liver fluke is completed.

The pathological findings in the biliary tracts caused by mechanical irritation of the worms include adenomatous hyperplasia of biliary epithelium with thickening of the wall and crypt formation. Periductal inflammation with some eosinophils, round cells and fibrosis in the portal areas may be noted. Obstruction of the narrow biliary tracts by the worms causes marked dilation of the distal parts, extensive hyperplasia of the biliary system and multiplication of biliary capillaries with glandular proliferation of papillomatous and adenomatous types. Chronic cholangitis and cholecystitis may occur. Cholangiocarcinoma is the most common associated tumor with opisthorchiasis of very long duration.

The clinical features are classified as 4 types depending upon the number of the worms and duration of the infection. The infection may be in (1) asymptomatic type, or (2) mild type with irregular episodes of flatulency and dyspepsia and a "hot sensation" over the liver area, or (3) moderate type with symptoms of mild cholangitis, dyspeptic flatulence, diarrhoea, or (4) severe type with chronic relapsing cholangitis, obstructive jaundice and cholangiocarcinoma.

The specific treatment so far is still unsatisfactory. Hetol at a dosage of 100 mg per kg body weight in 3 divided doses after meals every other day for 5 medication days has given a cure rate of 80-90%, but it has been found to give some unpleasant toxic effects and thus being withdrawn from the market. A new drug, "Niclofosan (Bayer 9015)" administered orally at a dosage of 1-2 mg kg body weight for 2-3 days has been found to be highly effective, and side effects were rather mild.

The control of opisthorchiasis consists of prevention through health education, to avoid eating raw fish food and improvement of environmental sanitation especially teaching the villagers to build and use latrines in order to interrupt the life cycle of the liver fluke. However, the results seem to be far from satisfactory due to socio-economic and cultural factors of the local people.

CLINICAL FEATURES OF LIVER FLUKE INFECTION OF MAN

VIKIT VIRANUWATI

Department of Medicine, Faculty of Medicine,
Siriraj Hospital, Bangkok, Thailand.

Infection caused by liver flukes produced protean manifestations. In mild grade infection in which the worm count is low, the patient may not exhibit any signs or symptoms at all. Many patients have no ill effects from liver flukes and are diagnosed accidentally when they are examined because of unrelated symptoms or signs and eggs are found in their stool. In moderate infections the patient may have anorexia, nausea, epigastric distress, fullness, and various dyspeptic symptoms. In heavy infections the patient has protean manifestations because of the direct effect of the worms producing intrahepatic and extrahepatic bile duct obstruction by mechanical effects, associated ascending bacterial infections, toxic metabolites from the worms themselves, and migration of the worms. Clinically, opisthorchiasis may present in many ways.

Hepatocellular Jaundice: This is the most common clinical form. Usually the patient has mild to moderate jaundice and splenomegaly. Anorexia, nausea, and weight loss are also prominent. The liver is usually firm. Fever may be present caused by ascending cholangitis. Tests indicate some parenchymal dysfunction. The clinical pattern of the disease is similar to that of chronic hepatitis or biliary cirrhosis. Later, evidence of cirrhosis such as superficial dilated veins, ascites, and ankle oedema supervenes. Hepatic coma, gastrointestinal bleeding, and secondary infection my terminate the course of the illness.

Obstructive jaundice: Patients in this group may be deeply icteric with acholic stools and itching. In many instances the gallbladder is palpable, simulating carcinoma of the head of the pancreas. This is actually caused by worms blocking the cystic duct or common bile duct.

Liver abscess: Some patients present with fever, leukocytosis, and cystic, tender enlargement of the liver. The cystic enlargement is caused by a biliary abscess secondary to ascending cholangitis.

Retention cyst: The patient has an enlarged, non tender, cystic liver. Aspiration of the liver yields fluid that varies in color and content. The aspirate may be clear and colorless as plain water or white bile, or it may be yellowish brown, bile stained, serosanguinous, transparent, or turbid. The cyst usually contains liver fluke ova that at times may be numerous and diagnostic of this condition. Occasionally adult worms are aspirated as transparent reddish parasites. There are numerous white blood cells and necrotic bile duct epithelium in the cyst with secondary bacterial infection.

Malignancy: In certain patients, associated malignancy was found. The patient usually seeks medical aid with a history of a mass in the liver region. Adenocarcinoma of the bile duct or cholangiocarcinoma are the most common concomitant malignancies. However, hepatocellular carcinoma associated with liver fluke has also been reported. The patient may have weight loss, fever, severe anorexia, jaundice, and an abdominal mass. The liver is always large and has an irregular consistency. Primary or secondary hepatic malignancy should always be suspected clinically. On examination, the mass described by the patient is always an enlarged liver with hard, cystic, single or multiple nodules of different consistency. Such patients succumb rapidly with terminal complications as found in any hepatic malignancy such as haematemesis, maelena, hypoglycemia, ascites, and hepatic coma.

Cholecystitis: In a small percentage of cases the patient may present himself with intermittent attacks of pain simulating acute cholecystitis. The worm may migrate into the common bile duct, cystic duct, or common hepatic duct. In rare instances the worm and eggs were found to be a nidus of gall stones. Ascending suppurative cholangitis is a common complication manifested by fever, chills and leukocytosis.

Pancreatitis: When the worms migrate into the pancreatic duct, symptoms and signs of acute pancreatitimay develop. Raised serum amylase or urinary diastase levels are found. The patient may exhibit a clinical picture of relapsing pancreatitis as well. However, acute haemorrhagic pancreatitis is rare.

Hepatobronchial or biliarobronchial fistula: This is a rare example of a protean manifestation of this disease, and the only case ever recorded in world literature. The patient, who came from a hyperendemic area, had a history of coughing up green or bile stained sputum. Its amount varied from little to 300 ml/day. The fistulous tract, demonstrated by bronchography was connected to the dilated biliary tree. Percutaneous transhepatic cholangiography also demonstrated the fistula. At autopsy eggs were found in the bronchial mucosa.

PATHOLOGY OF OPISTHORCHIASIS OF MAN: HISTOPATHOLOGIC STUDY AND ANALYSIS OF 50 CASES

BHINYO SUSILAVORN

Department of Pathology,
Sanpasithiprasong (Ubol) Hospital, Ubol, Thailand.

Fifty cases of patients undergoing needle liver biopsies, surgical liver biopsies, and cholecystectomy were studied; with particular emphasis being placed on histopathologic changes due to *Opisthorchis* infection relating to clinical manifestations and laboratory findings. There were mechanical disturbances of obstructive hepathopathy of both intrahepatic and extrahepatic levels, which were illustrated by histologic sections, photography and cholangiography. Types of cholestasis including the evidence of extravasation of bile from ducts, cholangitis, hepatic granulomas, cirrhosis, stones, cholangiocarcinoma, and hydrohepatosis were noted. Cases of cholecystitis and complications by bile peritonitis were also noted. The significant clinical manifestations were fever, right upper quadrant abdominal pain, jaundice, and hepatomegaly. Laboratory findings varied and indicated mixed pathogenesis of the combinations of hepatic and posthepatic obstructive mechanisms of jaundice. Biochemical results of the majority of cases were characterized by transaminases levels elevation,less than ten times normal. The GOT/GPT ratio were greater than 1.0. The alkaline phosphatase values were elevated,within three times the normal limits. Direct

reacting bilirubin were increased. Pathogenesis of histologic findings were discussed.

ULTRASTRUCTURE OF CHOLANGIOCARCINOMA ASSOCIATED WITH OPISTHORCHIASIS

TINRAT STITNIMANKARN, KLEOPHANT THAKERNGPOL, CHIAMCHIT DAMRONGSAK, ORAPAN CHINAPAK and KIJJA SINDHVANANDA

Departments of Pathology, Medicine, and Surgery, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok, Thailand.

An electron microscopical study was made on 11 liver biopsy specimens obtained from patients with cholangiocarcinoma associated with opisthorchiasis. The tumour cells of the well differentiated cholangiocarcinoma appeared to be scantier in cytoplasmic organelles. They contained relatively large nuclei, abundant free ribosomes and numerous groups of fine fibrils, and were surrounded by a basement membrane, with numerous long microvilli projecting into the glandular lumen. The moderately differentiated cholangiocarcinomatous cells revealed more cytoplasmic organelles, marked variation in the shape of the nuclei, small intranuclear cytoplasmic inclusions and shorter microvilli. The tumour cells showed intracellular microvillus-lined spaces, glycogen particles, abundant free ribosomes and numerous fine fibrils. The surrounding basement membrane was incomplete. The ultrastructure of the poorly differentiated cholangiocarcinoma was similar to those of the moderately differentiated tumour, except for scanty microvilli, abundant cytoplasmic organelles, and ill-defined or absent basement membrane in the former.

By electron microscopy, numerous intracellular fine fibrils, small intranuclear cytoplasmic inclusions without definite organelles and intracellular microvillus-lined spaces found in poorly differentiated cholangiocarcinomas with negative mucin stain, may help to distinguish them from hepatocellular carcinoma.

DETECTION OF HEPATITIS B VIRUS BY ORCEIN STAIN IN THE LIVER OF PATIENTS WITH OPISTHORCHIASIS WITH AND WITHOUT CHOLANGIOCARCINOMA

SUCHART CHAIMUANGRAJ, SUPIS CHUNGPANICH and SUKHUM BUNYARATVEJ

Department of Pathology, Faculty of Medicine, Ramathibodi Hospital, Bangkok, Thailand.

A new method of orcein staining for detection of hepatitis B virus has been recently described (Shikata *et al.*, 1974. *Jap. J. Exp. Med.*, 44:25). This provides a good opportunity to detect the presence of this virus in the liver tissue of various diseases. For this study, liver tissue from our autopsy material (1969-1977) diagnosed as opisthorchiasis with or without cholangiocarcinoma was selected. The total number of cases with opisthorchiasis was 23, 9 of which were opisthorchiasis alone, and 14 of which were opisthorchiasis with cholangiocarcinoma. Two cases out of the 9 opisthorchiasis alone showed the presence of hepatitis B virus (22.2%). Only 1 of the 14 cases of opisthorchiasis with cholangiocarcinoma yielded a positive reaction to the orcein stain (7.1%). The positive reaction was confined to the liver cells only, with none in the ductal cells or cells of the carcinoma. The fact that a lower prevalence of positive orcein staining reaction was observed in opisthorchiasis with cholangiocarcinoma suggests no cause effect relationship between hepatitis B virus and cholangiocarcinoma.

LIVER CHANGES IN HAMSTERS INFECTED WITH LIVER FLUKE *(OPISTHORCHIS VIVERRINI)* OF MAN

NATTH BHAMARAPRAVATI, WITAYA THAMMAVIT* and SUVAJRA VAJRASTHIRA**

Department of Pathology, Faculty of Medicine, Ramathibodi Hospital, *Department of Pathobiology Faculty of Science, **Department of Helminthology, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand.

The report deals with the major histopathological findings in hamsters, each infected with 100 metacercariae of *Opisthorchis viverrini*. There were 5 hamsters in each experimental group and were sacrificed at 3, 7, 14, 28, 45 and 154 days after the infection. Eighteen hamsters were used as control. The early pathological response consisted of an acute inflammatory reaction involving the bile ducts of the second order, and the portal connective tissue especially the large veins, and some coagulation necrosis of the liver lobules. As the flukes developed into adult flukes, they induced a net loss, and atrophy of the epithelial cells of the bile ducts in the neighbourhood of the flukes, and polyploidy of the nuclei, hyperplasia of the epithelial cells in the area away from the flukes. Later increased mucosal infolding and adenomatous formation of the bile duct mucosa were observed. The acute inflammatory reaction turned to subacute and chronic inflammatory response with eosinophils, monocytes, lymphocytes and plasma cell infiltration. There was concomitant bile ductule proliferation. Three kinds of granuloma were noted, the nonspecific ones seen in the lobules around the 2nd week, granuloma containing parasites or eggs, seen after the fourth week when flukes were fully matured. Resolution of the granuloma led to paraductal scar. In later stage, fibrosis around bile ducts, and multilobular cirrhosis, were observed. There was persistent hyperplasis of bile duct epithelial cells with adenomatous formation. Certain features of the liver response to the liver fluke infection suggest that immunopathologic mechanism may be important in the pathogenesis of the liver changes, were discussed.

EFFECTS OF DIMETHYLNITROSAMINE ON INDUCTION OF CHOLANGIOCARCINOMA IN *OPISTHORCHIS VIVERRINI*-INFECTED SYRIAN GOLDEN HAMSTERS

WITAYA THAMAVIT, NATTH BHAMARAPRAVATI,* SOMPHONG SAHAPHONG, SUVAJRA VAJRASTHIRA** and SUBHKIJ ANGSUBHAKORN

Department of Pathobiology, Faculty of Science, *Department of Pathology, Faculty of Medicine, Ramathibodi Hospital,**Department of Helminthology, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand.

Opisthorchiasis is an endemic parasitic disease in Northeastern Thailand. The concomitant occurrence of the parasite and cholangiocarcinoma as well as the incidence of such tumors is higher in that part of the country than in other areas. Nitrosating agents, nitrosatable substances and nitrosamine compounds are commonly present in several kinds of staple foods and foodstuffs in that region. To study the interactions between the parasite and nitroso compounds, syrian golden hamsters were divided into4 groups: untreated, dimethylnitrosamine (DMN, 0.0025% or 25 ppm) treated,100 metacercariae treated, andDMN (0.0025% or 25 ppm) plus 100 metacercariae treated groups. The animals that received both DMN and parasites developed cholangiocarcinoma(58.3%)andcholangiofibrosis (100%). The tumor was not observed in the groups which received either DMN or parasites alone. Nonetheless, cholangiofibrosis was found in some animals in the DMN group. This indicates that the combination of DMN administration and liver fluke infection plays an important role in the carcinogenesis of neoplasms of the intrahepatic bile ducts, possibly through the synergistic effects of the two.

HISTOLOGIC RESPONSES TO BCG VACCINATION IN LEPROSY PATIENTS

THAMRONG CHIRACHARIYAVEJ, NATTH BHAMARAPRAVATI and PAIROJE CHANMOLEE*

Department of Pathology, and *Department of Dermatology, Faculty of Medicine, Ramathibodi Hospital, Bangkok, Thailand.

Fifty-six leprosy patients and 5 healthy persons were studied by punch skin biopsy after BCG vaccination for 1-5 weeks period. The different histologic features were as follows:

In the group of tuberculoid leprosy, the biopsies showed granulomatous inflammation in 88% (23/26). In three cases (11%), Langhan giant cells were identified, and in other 20 cases (77%) there were only epitheloid cells, monocytes, plasma cells, lymphocytes, some histiocytes and PMN.

In the group of true borderline (Dimorphous) leprosy the biopsies showed mostly PMN, plasma cells, histiocytes, monocytes and few lymphocytes.

In the group of lepromatous leprosy in all patients (25/25)the histology showed nonspecific inflammation. The cells were mostly plasma cells, PMN, histiocytes with few monocytes and lymphocytes. Forty-four percent (11/25) formed abscess.

In the group of healthy persons, the histology resemble the borderline group except that the lymphocyte infiltration in this group predominated. The tuberculin tests (1:1000) were positive in every case (leprosy and healthy) ranging from 12-25 mm before BCG vaccination and 20-44 mm after BCG vaccination.

PARASITIC INFECTION IN THE AUTOPSY CASES AT THE BANGKOK CHILDREN'S AND WOMEN'S HOSPITAL WITH EMPHASIS ON *PNEUMOCYSTIS CARINII*

ARUNLUCK KOMINDR and NAWARAT NA SONGKLA

Institute of Pathology, Department of Medical Service, Ministry of Public Health, Bangkok, Thailand.

From a total of 5,417 autopsy cases reviewed during a-12-year period (1963-1974), 89 cases of protozoal and other parasitic diseases were found. They include 3 cases of toxoplasmosis, 7 cases of *Pneumocystis carinii* pneumonia, 15 cases of malaria, 21 cases of amoebiasis, 2 cases of hookworm infection, 7 cases of liver fluke infection, and 35 cases of ascariasis. The seven cases of *Pneumocystis carinii* pneumonia have been reviewed in detail. A case report of *Pneumocystis carinii* pneumonia in a 9-year-old boy who had both acute monoblastic leukemia and generalized miliary tuberculosis was presented.

STRONGYLOIDIASIS: REPORT OF A FATAL CASE

PAISAN LEELACHAIKUL, SAWANG CHUAHIRAN and VIJITR BOONPUCKNAVIG

Department of Pathology, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand.

An autopsy case of *Strongyloides* infection was reported. The infection was heavy and showed dissemination after corticosteroid administration. The patient, a 26-year-old Thai male from the province of Saraburi, was admitted to Ramathibodi Hospital with the diagnosis of nephrotic syndrome. He had received conventional therapy for the kidney disease including high doses of prednisolone (30 mg./d.), which were given during the 8 months before admission. He died on the seventh day of hospitalization. Autopsy findings revealed focal hyaline and sclerosing glomerulonephritis of both kidneys and disseminated infection of *Strongyloides stercoralis* involving many organs including the intestines, appendix, heart, trachea, lungs, brain, soft tissue, omentum, lymph node, skin, blood and lymphatic vessel, and peripheral nerve. Ascitic fluid smears and sections of coagulated ascitic fluid showed numerous parasites. The spinal cord also showed the tract of the parasite with minimal haemorrhage. Blood and tissue eosinophilia were absent, and there was no granulomatous inflammation in any organ. The lungs revealed hyaline membrane formation.

The findings in this case emphasize the importance of the search for parasitic infections before the administration of corticosteroid or immunosuppressive drugs.

CLINICAL FEATURES, INVESTIGATION AND TREATMENT OF THE TROPICAL SPLENOMEGALY SYNDROME DUE TO MALARIA

J. T. PONNAMPALAN

Institute for Medical Research, Kuala Lumpur, Malaysia.

Six cases of the splenomegaly syndrome were described. All the patients were aborigines, living in the jungles of West Malaysia. Two of the cases were from Ulu Kelantan, two from central Pahang on the eastern side of the country, and two from Negeri Sembilan in the south. Three of the cases were children of varying ages e.g. 14 months, 5 years and 14 years respectively; the rest were adults, 25 years, 26 years and 39 years of age. Intermittent fever was present in two cases who were both children aged 14 months and 5 years respectively. Mild to severe froms of anaemia were present, the lowest level of haemoglobin being 5.0 grams per cent in a pregnant adult.

There is accumulating evidence that the tropical splenomegaly syndrome represents an unusual host-parasite reaction to malaria, and that prolonged antimalarial therapy will cause regression of the spleen in most cases.

The criteria used for the diagnosis of the condition were:- Splenomegaly with or without hepatomegaly, intermittent fever, high titre of malaria antibodies, response of the patient to antimalarials, blood films repeatedly negative for malaria parasites, history of irregular ingestion of chloroquine for treatment or prophylaxis, and continued residence in a highly malarious area.

A combination of chloroquine, dapsone, pyrimethamine and primaquine were used in the treatment of these cases.

POSTMORTEM EXPERIENCE WITH SCHISTOSOMIASIS AT CHULALONGKORN HOSPITAL

SAMRUAY SHUANGSHOTI

Department of Pathology, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand.

Schistosomiasis has been a minor health problem in Thailand because of its rarity. Only 2 cases were encountered among 3,009 autopsies done at Chulalongkorn Hospital from January 1968 to December 1976. The autopsy rate during this 9-year period ranged from 35 to 40 per cent of deaths. This general university hospital in Bangkok has about 1,200 beds: it serves not only for local patients but also for patients from all parts of Thailand, a country of about 42 million population.

The first case was a 36-year-old male farmer who lived permanently at Pichit province. This town in the central part of Thailand is about 200 miles north of Bangkok. The patient gave the history of occasional mucus and bloody stool for 10 years, an episode of jaundice 6 years before hospitalization, and splenomegaly for a few years. Eggs of *Schistosoma japonicum* were present in the rectal and hepatic biopsies and in the stool. The removed spleen, 1,460 gm showed severe chronic passive congestion. An autopsy 2 years later (A-7553) revealed granulomas containing eggs of *S. japonicum* in the liver, pancreas, and lungs, in association with advanced hepatic fibrosis. Considerable serofibrinous pericarditis was the terminal complication and the immediate cause of death in this case.

The second case, a 20-year-old housewife, was born at Pichit province but subsequently lived at Patumwan District of Bangkok. The duration of residence in each place was not known. She died, gave a history of sore throat, fever, and severe dyspnea for about a week. At autopsy (A-8011), the myocardium was diffusely infiltrated by lymphocytes, histiocytes, and a few neutrophils. Moreover, a small number of granulomas with eggs of *S. japonicum* were seen in the liver and lungs. Schistosomiasis in this case was an accidental postmortem finding in a patient who died of diffuse myocarditis.

In Thailand, a small number of cases of schistosomiasis have been noted in the following provinces; Nakhon Si Thammarat, Surat Thani, Phitsanulok,and UbonRatchathani. Pichit is therefore another province to be recorded. The second patient in this report might be considered a case of schistosomiasis in Bangkok.

INTRODUCTION TO SCHISTOSOMIASIS

EDITO G. GARCIA

Department of Parasitology, Institute of Public Health, University of the Philippines System, Manila, Philippines.

Schistosomiasis refers to a group of chronic granulomatous diseases caused by bloodflukes of the genus *Schistosoma*. Three species, *Schistosoma japonicum*, *S. mansoni* and *S. haematobium* cause serious diseases due to the deposition of their eggs in the tissues. *S. japonicum* and *S. mansoni* live in branches of the portal vein and cause hepatointestinal schistosomiasis while *S. haematobium* inhabits veins of the urinary bladder and cause urinary schistosomiasis. These infections are important public health problems in many tropical and subtropical countries of Asia, Africa, the Western Hemisphere and the Far East.

Schistosomes have similar life cycles. Ova of *S. japonicum* and *S. mansoni* pass out with the faeces through intestinal ulcerations while those of *S. haematobium* pass with the urine. Mature eggs on contact with fresh water hatch with the liberation of a larva, the miracidium. This enters an appopriate snail where further development must take place for the formation of the infective stage, the cercaria. Infection is by skin penetration upon contact with fresh water. The cercaria, after skin penetration, is transformed in a schistosomule which migrates through the circulation and tissues to reach its habitat. Maturation requires 4 weeks and culminates in intense and sustained egg-deposition. Schistosomes may live in man for 30 years.

Although lesions due to cercarial penetration and schistosomular migration are described, the principal pathological and clinical features of schistosomiasis are due to the continuous egg-deposition and the granuloma formation around the ova. Circulating immune complexes filtered in the kidneys may also contribute to the pathology. Some problems of immunopathology and others were also discussed in the presentation.

SCHISTOSOMIASIS IN THE LOWER MEKONG BASIN: CURRENT STATUS OF SCHISTOSOMIASIS IN LAOS, THAILAND AND MALAYSIA

SANTASIRI SORNMANI

Department of Tropical Medicine, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand.

Among the 4 riparian countries of the Lower Mekong Basin schistosomiasis japonica was discovered in Thailand, Laos and Cambodia. Studies on epidemiology and the snail intermediate host was carried out only in Thailand and Laos.

In Laos, the epidemiological survey in 1969 revealed Khong Island (pop. approx.10,000) as the endemic area of schistosomiasis japonica with a prevalence of 14.4%. The natural reservoir host were dogs with a prevalence of 10.9%.

In Thailand, the first endemic area was disclosed in 1960, at Nakhon Si Thammarat province in South Thailand. Few more cases were reported from Phitsanulok (1964) and Phichit (1971) provinces in Central Thailand: from Ubon Ratchathani (1964) province in the Northeast and from Surat-Thani (1973) in South Thailand.

In South Vietnam the transmission of schistosomiasis so far, has not been found.

In Malaysia a case of schistosomiasis was accidentally discovered in 1973 from the histological examination of tissue of a female aboriginese living in Pahang state. No turther investigation has been elucidated yet.

The adult worm of Mekong schistosome was first discovered in 1969, from the natural infected dogs on Khong Island. The study on morphology revealed a significant difference from the classical *S. japonicum*. But, the size, shape of the egg of Mekong schistosome showed some distinctive character as being smaller and rounder.

The most significant difference between the classical *S. japonicum*, and Mekong *Schistosoma* was the snail intermediate host, since the Mekong schistosome could only develop in an aquatic snail *Lithoglyphopsis aperta* (Temcharoen).

L. aperta is an aquatic snail which exists in the Mekong River and its tributaries. Further studies have shown that there are 3 races α, β, and γ which are distributed from Khemarat, a district on the Thai side of the Mekong River down through to Khong Island in Laos. In laboratory tests, these snails were susceptible to Mekong *Schistosoma*. Natural infection of γ race *L. aperta* was also evident on Khong Island.

The investigation on the cross susceptibility has revealed that *L. aperta* was not susceptible to the miracidia of classical *S. japonicum* and that the miracidia of Mekong *Schistosoma* could not develop in *Oncomelania* snails.

The clinical study on Khong Island, Laos, revealed that Mekong schistosomiasis produced similar clinical manifestations as in other countries in Southeast Asia. The children and young adults between 8-19 years of age were afflicted with severity of the disease. The disease is apparently well tolerated by the adults and old age groups. However, it was also noticed that in Thailand, schistosomiasis could be considered as asymptomatic, since most of the reported cases were either discovered at necrospy from the histological sections or from rectal biopsy.

Though current study has thrown more light into the knowledge of Mekong schistosomiasis, it is still inadequate. Some crucial information are lacking such as clinical trials of proposed chemotherapy against schistosomiasis have not been elaborated. For methodology of control reseach on the ecology of *L. aperta* and the effectiveness of current molluscicides or biological control have not yet been fully processed.

Concurrently, since certain distinctions between the Mekong *Schistosoma* and the classical *S. japonicum* could be observed and together with different snail intermediate hosts it might not be too early to consider that Mekong *Schistosoma* is actually another species of human schistosome which exists in the Lower Mekong Basin.

PATHOLOGY OF MANSON'S SCHISTOSOMIASIS

ZILTON A. ANDRADE

Department of Pathology,
University of Bahia Medica School, Salvador,
Bahia, Brazil.

Schistosoma mansoni, the only species of schistosome found in Brazil, lives in the mesenteric veins of mammalian hosts and causes lesions by the deposition of eggs, mainly in the liver. Man is the most important definitive host for this parasite. Pathology of schistosomiasis can be considered under the following headings:

(1) Acute schistosomiasis: This form is usually due to a massive primary infection occurring in people coming to endemic areas for the first time. Large granulomas, with many eosinophils and a necrotic central area, form around mature eggs, which can be found in many organs and in great numbers. Hypersensitivity to egg antigens probably plays a major role in pathogenesis.

(2) Mild chronic schistosomiasis: The large majority of infected people pass eggs in the stools, but show only mild intestinal or general symptoms, or are even asymptomatic, although they are continously exposed to cercarial infection. In this form, lesions are represented by scattered egg granulomas in the liver, intestines and sometimes in the lungs, or rarely in some ectopic location. These patients have probably developed a high degree of resistance to reinfection and are also capable of limiting egg lesions by producing small, discrete granulomas.

(3) Hepatosplenic schistosomiasis: This is really the most important form of schistosomiasis, although it occur in only 4% to 8% of all infected people living in endemic areas. This form is believed to be related to high worm burden. It results when many worm pairs are producing many eggs which are trapped in the liver and cause intrahepatic portal vein destruction, and portal fibrosis (pipe-stem fibrosis). The main clinical consequence is a pre-sinusoidal portal hyper-

tension, with splenomegaly and collateral circulation (esophageal varices). When the intrahepatic radicles of the portal vein are being obstructed a progressive compensatory hypertrophy of the hepatic artery takes place and brings out a series of hemodynamic changes in the liver.

Complications are represented by: Pulmonary involvement due to massive egg embolization through collateral circulation, followed by pulmonary arteritis, pulmonary hypertension and cor pulmonale; (ii) Immune complex renal disease, with a spectrum of glomerular lesions, including several types of glomerulonephritis; (iii) Primary, isolated nodular lymphoma of the spleen, which was observed in 1% in splenectomy material from cases of hepatosplenic schistosomiasis; (iv) Association with some chronic diseases, which may then show a peculiar clinical presentation. Salmonellosis and viral hepatitis are the two most studied conditions in this regard.

(4) Pseudo neoplastic schistosomiasis: Focal lesions simulating neoplasms such as carcinoma of the colon and mesenteric lymphoma may be caused by the depostion of many eggs evoking a focal but intense fibroplastic reaction.

(5) Ectopic schistosomiasis: Egg granulomas can occasionally by seen outside the portal and pulmonary territories, under the form of scattered periovular granulomas in such organs as the brain, spinal cord, adrenals, thyroid, heart, etc. In our material, only when such lesions affect the spinal cord causing transverse myelitis, they acquire clinical significance. Such cases of schistosomiasis of the spinal cord are rather rare.

CLINICAL SYNDROME OF FILARIASIS IN THAILAND

SUPAT SUCHARIT

Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand.

Among sixteen species and forms of Filaria that infect man *Brugia malayi* and *Wuchereria bancrofti* are the causative agents of filariasis in Thailand. Two forms of *B. malayi* infection are scatterly distributed mainly on the east coast of South Thailand in Chumphon, Surat-Thani, Nakhon Si Thammarat, Phatthalung, Songkhla, Pattani and Narathiwat Provinces. The majority of filaria is nocturnally periodic *B. malayi* transmitted by *Mansonia uniformis*, *M. indiana*, *M. bonneae* and *M. annulata*. The other form of *Brugia* in Chumphon, Nakhon Si Thammarat and Narathiwat is nocturnally subperiodic *B. malayi* transmitted by *M. bonneae*, *M. dives* and *M. uniformis*, and this form has animal reservior. The clinical syndrome are lymphangitis, lymphadenitis, elephantoid fever and elephantiasis of extremities, mainly legs, are similarly found in both forms.

Two forms of rural *Wuchereria bancrofti* are present in Thailand. Nocturnally subperiodic *W. bancrofti* in Kanchanaburi province transmitted by *Aedes niveus* group, the tree-hole breeder. The other form is nocturnally periodic *W. bancrofti* in Narathiwat. The clinical syndrome are epididymoorchitis, hydrocoele, chyluria and oedema of legs.

Rare syndromes due to filariasis e.g., tropical pulmonary eosinophilia, occular filariasis due to *B. malayi* subcutaneous nodules due to *Dirofilaria repens* and *D. immitis* and pulmonary infarction due to *D. immitis* have not yet been reported. Only one case of *Dirofilaria conjunctivae* in a subcutaneous nodule was reported in Thailand.

MECHANISM OF DISEASES IN BRUGIAN AND BANCROFTIAN FILARIASIS

V. ZAMAN

Department of Parasitology, University of Singapore, Singapore.

The review briefly describes the pathological manifestations and the mechanism of disease seen in *Brugia malayi* and *Wuchereria bancrofti* infections. This was followed by a discussion of the spectrum of infected cases as seen in a given endemic area consisting of:- (a) patients with microfilaraemia but without any disease; (b) patients with microfilaraemia and disease; and (c) disease without microfilaraemia (occult filariasis). Attention was drawn to theories accounting for the survival of microfilaria in some individuals and their rapid disappearance in others. Variability of response in various animal hosts and the immunological basis of the adverse reactions seen during antifilarial chemotherapy was discussed.

DETECTION OF HEPATITIS B VIRUS IN LIVER DISEASE BY MEANS OF ORCEIN STAIN: A PRELIMINARY REPORT

MANA ROCHANAWUTANON, SUCHART CHAIMUANGRAJ and SUKHUM BUNYARATVEJ

Department of Pathology, Faculty of Medicine, Ramathibodi Hospital, Bangkok, Thailand.

Tissues from the following were selected for study: Cirrhotic liver with and without liver cell carcinoma (LCC), LCC without cirrhosis, opisthorchiasis, opisthorchiasis with cholangiocarcinoma and metastatic carcinoma. Control materials were obtained from the livers of fatal accident cases. Paraffin blocks from formalin and Zenker's fixed tissue were recut and stained with orcein for detection of hepatitis B virus by the recently described method of Shikata in 1974. In both groups of cirrhotic livers, 77.4% of 31 cases were positive to orcein stain. Of these, cirrhosis without LCC yielded a prevalence of 69.6% (23 cases) and cirrhosis with LCC yielded a prevalence of 100% (8 cases). In the one case of LCC without cirrhosis available for study the orcein stain was positive. It was observed that positive reactions were seen in the noncancerous areas, and in no instances, in the tumor areas. In the tissues with a high degree of haemorrhagic necrosis, a low degree of orcein positivity was noted. There was no appreciable direct relationship between cirrhotic activity and the degree of orcein positivity. The groups of opisthorchiasis with and without cholangiocarcinoma yielded a relatively lower percentage of orcein positivity (22% and 7.1% respectively). Twenty-two cases of normal livers and five cases of metastatic carcinoma were non-reactive to

orcein staining. These observations suggest an intimate relationship between the presence of hepatitis B virus in liver tissue and cirrhosis, as well as, liver cell carcinoma.

GNATHOSTOMIASIS, A POSSIBLE AETIOLOGIC AGENT OF EOSINOPHILIC GRANULOMA OF THE GASTROINTESTINAL TRACT

VORACHAI SIRIKULCHAYANONTA and NIDHI CHONGCHITNANT*

Department of Pathology, Faculty of Medicine, Ramathibodi Hospital, Mahidol University Bangkok, and* Department of Pathology Prince of Songkla University, Thailand.

A 42 year-old Thai male from central Thailand came to Ramathibodi Hospital with the complaint of abdominal pain. The physical examination revealed localized tenderness in the right lower quadrant. The clinical impression was acute appendicitis and an operation was performed revealing a large mass in the caecum. A right hemi-colectomy was done for what was thought to be a carcinoma of the colon. The resected colon showed subserosal thickening on the antimesenteric side of ascending colon with a constricted area at the middle portion. An immature adult *Gnathostoma spinigerum* was identified in the thickened subserosa of the caecum. The microscopic examination of the involved bowel showed a heavy infiltration of eosinophils, fibroblasts, histiocytes and a mild to moderate oedema. The findings were consistent with eosinophilic granuloma of the gastrointestinal tract and the presence of the parasite in the affected bowel suggested that it was the aetiologic agent.

REYE'S SYNDROME-A COMPARISON BETWEEN CITY AND RURAL CASES: A REVIEW

SUBHKIJ ANGSUBHAKORN, NATTH BHAMARAPRAVATI* VORACHAI SIRIKULCHAYANONTA,* SOMPHONG SAHAPHONG and WITAYA THAMAVIT

Department of Pathobiology, Faculty of Science, *Department of Pathology, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Bangkok, Thailand.

Reye's syndrome is an acute and often fatal childhood illness which is characterized by encephalopathy and fatty degeneration of the viscera. The incidence patterns of Reye's syndrome in the city and in the rural areas of Thailand have been compared and a much higher incidence was found in the rural areas. Clinical, laboratory and autopsy findings were similar in both areas. The pattern of age distribution in rural cases was quite different from the city cases. Approximately 70% of the patients were less than one year of age in the city while those of the rural areas were aged one to seven years (80%). Girls were affected more than boys in the rural population while the contrary was seen in the city. The seasonal distribution was similar in both rural and city cases, that is, most of the cases occurred during the rainy season (July-October). In the city cases influenza A virus was isolated in one patient and salicylate was detected in the blood of two patients. In contrast to the cases in the city, aflatoxin and other mycotoxins were indicated as a possible cause of Reye's syndrome in the rural areas. The lower age range in the city cases was probably due to the earlier enhancing effect from viral infections in the presence of environmental toxins eg., mycotoxins and salicylate or other factors.

HUMAN ADULT TOXOPLASMOSIS: REPORT OF THREE FATAL CASES

SUKHUM BUNYARATVEJ, SUCHART CHAIMUANGRAJ, CHAOWALIT PAIROJKUL and DEJA TANPAICHIT*

Department of Pathology and Infectious Diseases and Host Defense Unit, *Department of Medicine, Ramathibodi Hospital, Bangkok, Thailand.

Three fatal human adult cases of Toxoplasmosis were reported with autopsy findings. This is the first report from Thailand, although a recent serological survey in this country showed significant antibody levels in 15% of apparently healthy individuals. In one case, associated with tuberculosis, the diagnosis was only established at autopsy. The other two cases presented with prolonged fever with lymphadenopathy and jaundice. Despite the diagnosis, given presumptively on histological grounds and confirmed by the serological indirect fluorescent antibody test, treatment was ineffective. At autopsy, the gross and microscopic findings under the light microscope were generally quite non-specific as was the clinical picture. Extensive microscopic search, assisted with electron microscopic study, was required before a definitive diagnosis could be made. An increased awareness of this disease by both the clinicians and pathologists is essential and may lead to its more frequent recognition and early diagnosis in the future.

A CASE OF SCHISTOSOMIASIS JAPONICA IN JAKARTA

A.N. KURNIAWAN, P. HADIDJAJA* and S. SURJA**

Department of Anatomic Pathology, Faculty of Medicine University of Indonesia, Jakarta, *Department of Parasitology and General Pathology, Faculty of Medicine, University of Indonesia, Jakarta, **Husada Hospital, Jakarta, Indonesia.

Schistosomiasis japonica is not commonly found in Indonesia, except in endemic areas of Lindu and Napu Valley. The case reported was a 75-year-old Chinese female residing in Jakarta, who was born in the mainland of China. She came to settle in Indonesia fifty years ago, then visited China several times and spent some time there.

She had a mass in the right colon which clinically and radiologically was suspected as colon cancer, and treated as such. Then she had liver enlargement and jaundice, suspected as signs of metastasis. A liver biopsy was performed. The histologic picture showed changes which were consistent with hepatic schistosomiasis. The liver function tests showed some abnormalities. The spleen was not enlarged. A rectal biopsy was done and revealed deposition of schistosome eggs

in the submucous layer. However, repeated stool examinations failed to find the eggs.

This is the fifth case of non-autochtonous infection with *Schistosoma japonicum* reported in the Indonesian literature thus far known.

STUDIES ON THE RELATIONSHIP BETWEEN CLINICAL NUTRITIONAL IMPROVEMENT AND PLASMA TRANSFERRIN LEVEL IN CHILDREN WITH SEVERE PROTEIN-ENERGY MALNUTRITION

SATAIONO

Department of Child Health, Medical Faculty, Hasanuddin University, Ujung Pandang, Indonesia.

In developing and tropical countries such as Indonesia, infectious diseases and protein energy malnutrition (PEM) especially those affecting young children still commonly coexist.

There are two theories concerning the pathogenesis of kwashiorkor and marasmus. The first theory proposed that kwashiorkor results from a deficiency of protein with relatively adequate energy supply, whereas marasmus is caused by an overall deficiency of energy and protein. The second theory proposed that the difference in the clinical picture reflects not a difference in the diet but a difference in the capacity of the child to adapt.

It is clear from the result of many experiments and investigations that the biochemical patterns of marasmus and kwashiorkor is different. Numerous biochemical measurements have been proposed for the assessment of PEM which have been directed toward two main objectives i.e. to find and index which aids the identification of early PEM and an index which allow the clinicians to estimate the severity and prognosis of severe PEM.

Two hundred and eighty eight children under five years with normal and mild-moderate PEM from Outpatient Department and 25 cases with severe PEM from Pediatric Nutrition Ward, Department of Child Health, Cipto Mangunkusumo General Hospital, Jakarta, were studied.

Results from this present study showed that plasma transferrin seemed to be a better parameter for the prognosis of treated severe PEM cases, and more sensitive than plasma albumin in the assessment of the nutritional status. Since there is no single best biochemical test for field assessment of nutritional status, the plasma transferrin determination proved to be useful in detecting early undernutrition when it was applied together with other biochemical parameters and with proper interpretation.

INTESTINAL PERFORATION

SJAUKANI GUMAY and S.O. SRI WIDODO

Department of Anatomical Pathology, Faculty of Medicine, University of Indonesia, Jakarta, Indonesia.

A total of 162 cases of intestinal perforations were received by the Department of Anatomical Pathology, Faculty of Medicine, University of Indonesia during 1975 and 1976, consisting of 125 males and 37 females. The youngest age was 1 day and the oldest 65 years. The most frequent site of this perforation was the ileum,clinically almost always diagnosed as typhoid perforation. However, these cases did not always show the typical histopathological picture of typhoid fever. Three cases occurred after an accident. One case of the ileum showed a peptic ulcer with perforation. Seven of these perforations occurred in the neonatal period. The histopathological picture of all these cases were reported and discussed.

IMMUNOLOGICAL STUDIES OF MALAYSIAN ABORIGINES: SERUM IMMUNOGLOBULIN LEVELS

F. MOOSDEEN, V.K.E. LIM, E.J. AW and N. NAGAPPAN*

Department of Microbiology,
The National University of Malaysia, Kuala Lumpur, and The Aboriginal Hospital, Gombak, Malaysia.

The Semai are a tribe of aborigines (Orang asli) found in West Malaysia. They are jungle dwellers and still lead a comparatively primitive way of life. They number approximately 15,000 (Chander, 1970). To our knowledge, no comprehensive study of the immunoglobulin levels of West Malaysian aborigines has been reported. In this study the levels of serum IgG, IgA and IgM of the Semai were measured for purposes of documentation and comparison with other populations. This study forms part of a detailed analysis of the immunological status of the aborigines of West Malaysia. It is felt that such an analysis is important in enabling further tnvestigations into immunopathological mechanisms of tropical diseases particularly of those that are prevalent in indigenous peoples of Southeast Asia.

TROPICAL DIPHTHERIA: A GEOGRAPHIC MEDICINE DISEASE?

ARNUWATRA LIMSUWAN, VORANUNT SUPHAKARN*, ORATHAI AMATAYAKUL, PRADIST NANNA** and PREM BURI**

Department of Medicine, *Pediatrics, **Surgery, Faculty of Medicine, Ramathibodi Hospital, Bangkok, Thailand.

In prevention and control of the diseases during the epidemic trend, the vaccination against that organism must reach 70% of total population. By our survey it was observed that the vaccination against diphtheria, tetanus and pertussis in rural Thailand, especially in Bang-Pa-In is very low. In some villages of Bang-Pa-In the vaccination level to the diseases mentioned was nearly zero. One would expect the outbreak of diphtheria in Bang-Pa-In. But from survey questionaire there was no diphtheria outbreak in the district for the past 15 years. The hypothesis of this observation is that the natural immunity to diphtheria might play some role in preventing such an outbreak.

Simple random sampling for Schick test was done on 190 children age 1-9 with the history of no previous immunization against D.P.T. in Tambol Chiang Rak Noi, Bang-Pa-In district. It was found that 67.83%

of the children in that community had immunity to diphtheria, of 303 children in whom the bacteriological examinations were done, 39 children were found to be positive for corynebacterium, 6 cases or 15% were *Corynebacterium diphtheriae*. For the 6 positive cultures for *C. diphtheriae*, two cases were found to be from skin lesions. One case was positive for *C. diphtheriae* from both skin and throat. The high level of herd immunity against diphtheria and the presence of *C. diphtheriae* in the skin and throat carriers of the rural villagers enhance the theory of the role of the natural immunity of diphtheria in preventing the outbreak of the disease in the community. The isolation of same organism in the skin and throat in the same case suggests the intraindividual transmission of the organism from the skin to the throat or vice-versa. Dangerous carriers of diphtheria were recognized in this study.

ANGIOSTRONGYLUS CANTONENSIS IN THE SPINAL CORD OF AN ADULT FEMALE WITH EOSINOPHILIC MENINGITIS IN THAILAND

CHAWALIT PAIROJKUL, SUTEE YOKSAN and SAWARNG CHUAHIRUN

Department of Pathology, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand.

In 1945 Nomula and Lin reported the discovery of *A. cantonensis* in the cerebrospinal fluid of a patient with eosinophilic meningitis. Numerous reports, including some in which this parasite has been demonstrated in the brain, support the belief that this rat lung worm is the aetiologic agent of epidemic eosinophilic meningitis in the Hawaiian Islands and the South Pacific as well as in East and Southeast Asian countries.

The present report describes the case of a-43-year-old Thai female with eosinophilic meningitis, paraplegia and sensory loss in which a living *A. cantonensis* was discovered in the subarachnoidal space at the T_{5-6} level. This is the first record of such a finding in Thailand.

PATHOPHYSIOLOGIC RESPONSE IN *P. falciparum* MALARIA

PANATA MIGASENA and FRANK P. SCHELP

Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand.

Serum protein fractions are useful in establishing not only in the presence of certain acquired pathophysiologic stages but also in assessing progression and response to therapy. The test was performed in 27 patients with acute *P. falciparum* malaria at Prapokklao Hospital, Chantaburi Province, Southeast Thailand, the endemic area of chloroquine-resistant *P. falciparum* malaria by using polyacrylamide gel electrophoresis and electroimmunoassay.

The total protein, creatinine, α, -acid glycoprotein and the first post albumin peak were found to be significantly elevated. Transferrin was significantly lower in the malaria patients when compared to the control group and remained so during the time of observation even after the infection was cured. It was interesting to note that untreated malaria cases with fever for more than 4 days the prealbumin, transferrin and SGOT activity decreased significantly when compared with a control group and a group of malaria patients who were treated at an earlier stage of the infection. Total protein was significantly lower only in the group of untreated malaria with fever for more than 4 days.

The significant of this approach especially as a parameter for acquired pathophysiologic stages and also assessing progression or response to therapy are also discussed as a non-specific host response on the significance of a chain reaction of pathophysiological processes in the development of malaria.

FIBROPLASTIC ENDOCARDITIS WITH EOSINOPHILIA

SOMNUK JESDAPATARAKUL

Department of Pathology, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok 4, Thailand.

An autopsy case of Loffler's endocarditis parietalis fibroplastica with eosinophilia in a 46-year-old Thai male was presented. The clinical manifestations began 10 years prior to admission with intermittent oedema and orthopnea which were relieved by diuretic therapy. Five months before death he had jaundice and progressive cardiac failure that resisted the usual treatment. Death was precipitated by massive subcapsular haemorrhage of the liver during the clinical investigation. The autopsy showed marked thickening of the endocardium with mural thrombus formation. Eosinophilia in the visceral organs with thromboembolic phenomenon were also found. The differential diagnosis, pathology and pathogenesis were discussed.

THE ASSOCIATION OF DYSPLASIA AND HERPES SIMPLEX VIRAL INFECTION IN THE FEMALE GENITAL TRACT

SONGSEE SRIVANNABOON

Department of Pathology, Faculty of Medicine, Ramathibodi Hospital, Bangkok, Thailand.

The prevalence rate of Herpes Simplex Viral (HSV) infection of the female genital tract in the seven year period (1970-1976) was 3.5/1000 smears screened in the cytology section, Department of Pathology, Ramathibodi Hospital, Bangkok.

The cellular changes of infection with Herpes virus were quite distinctive, consisting of nuclear enlargement, multinucleation, and the formation of intranuclear viral inclusions. There were no false positive diagnoses by cytology in the 10 cases which were confirmed by histology.

The clinical data on 173 cases in which the reports were available showed that 6% of the patients were single and 25% were pregnant at the time of infection. More than half of the cases occurred during the winter season and 80% of the patients were under 30 years

of age. The majority of the cases presented with ulcerative lesions but 5% were asymptomatic and 7% did not manifest any abnormal gynecological findings. Two babies born per vagina to mother with herpetic genital infection at the time of delivery died because of viremia.

In all cases in which dysplasia was found associated with HSV infection and which could be followed up, the dysplastic cells reversed to normal in successive smears.

STUDIES ON ATP LEVEL IN ERYTHROCYTES OF PATIENTS WITH *PLASMODIM FALCIPARUM* MALARIA

SUVIT AREEKUL, AREE SOOKPRASERT
and KANOKWAN UKOSKIT

Department of Radioisotopes, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand.

Erythrocyte ATP contents were determined in 27 patients with *Plasmodium falciparum* malaria with parasitaemia ranging from 1 to 105 parasites per 1000 red cells. A mean value ± one S.D. of 119.05 ± 30.75 μM/100 ml red cells (range 58.8 - 189.7) in these patients was not significantly different ($P > 0.05$) from the value of 116.87 ± 30.63 μM/100 ml red cells obtained from 142 normal subjects. The infected blood samples were separated into different layers by using 0.7 and 0.8 M sucrose solutions. The calculated ATP content of parasitized red cells in these layers was found to be much higher than that of the non-parasitized red cells while the latter showed the same or lower content of ATP than that of the normal blood. There was a reverse relationship between the parasitaemia and the ATP contents of the parasitized red cells or infected blood.

PROTEIN-CALORIE MALNUTRITION IN THAI ADULTS: ASSESSMENT AND PATHOGENESIS

VICHAI TANPHAICHITR,
SURAT KOMINDR and SWAIRIN CHOTIBUT

Division of Nutrition, Departments of Medicine and Research Center, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand.

Seventy-four patients admitted at the Medical Service of Faculty of Medicine, Ramathibodi Hospital, Bangkok, Thailand were assessed for their nutritional status. The prevalence of protein-calorie malnutrition (PCM) in these patients based on various parameters was as follows:59.3% according to weight-height, 83.8% according to triceps skin fold thickness, 52.9% according to upper arm muscle circumference, 51.5% according to hair root morphology and 54.7% according to serum albumin level. These data reflected the disproportionate loss of the patients' body tissues. Physical signs indicative of PCM, including easily pluckable hair, loss of maxillary and temporal fat pads, muscular wasting, pretibial oedema, ascites and white band at finger nails were present in 10.8% to 29.7% of the patients.

The five leading causes, as the primary diagnosis of the patients in this study were infectious, cardiovascular, malignant, renal and neurological diseases. All of these diseases affected the nutritional status of the patients. On the survey date, 33.5% of the patients received partial parenteral nutrition given in the form of 5% or 10% dextrose solution which indicated inadequate dietary supply. This study signifies that intensive nutritional management should be done to combat hospital PCM.

ACCESSORY URETHRAL CANAL AND ACTINOMYCOSIS OF URINARY BLADDER

PISIT SANPITAK
and POONSIRI SEENAWAT*

Faculty of Medicine, Khon Kaen University and *Department of Pathology, Khon Kaen Provincial Hospital, Khon Kaen, Thailand.

A case of actinomycosis of urinary bladder with clinical manifestation simulating a carcinoma of urinary bladder in a young Thai fisherman was presented. The route of infection through a congenital accessory urethral canal predisposed by the occupation of the patient is very unusual.

Infection by anaerobic actinomycetes, although sporadically seen, has a worldwide occurrence. In Thailand approximately ten cases of actinomycosis have been reported. Most of the clinical manifestations appear in abdominal form by primarily involving the appendix or large intestine, or in cervico-facial form with secondary extension to other organs.

A 20 year-old Thai fisherman from Kalasin province was admitted to Khon Kaen Provincial Hospital on January 13, 1975 with the chief complaint of having had a gradually growing suprapubic mass for about one month with occasional dysuria and turbid urine. Physical examination revealed a non-tender smooth-surface, hard, round-shaped, suprapubic mass, 5.0 cm. in diameter. The patient was afebrile and had no remarkable findings except a moderate anaemia of 11.4 gm% haemoglobin. Peripheral white blood count was 11,900 per c. mm, with 62% neutrophils 15% eosinophils, 22% lymphocytes and 1% basophils. Urinalysis showed specific gravity 1.027, pH 6, one plus albumin, negative sugar, few calcium oxalate crystals and epithelial cells, and 10-20 W.B.C. per high power field. Stool examination was not performed.

Cystoscopic examination gave the impression of a urinary bladder tumor, probably from the outer region of the dome, probably a urachal tumor.

Exploration revealed a frozen pelvis and a hard white mass at the dome of urinary bladder that appeared to infiltrate the rectum and midpart of ileum. Excision of the mass including the attached anterior abdominal muscles, sigmoid colon and mid-ileum and partial cystectomy with end-to-end anastomoses of the resected ileum and the resected colon was performed. Histopathologic examination revealed intact bladder and bowel mucosae with cellular appearance of the perivesical tissue composed of active spindle cells and vacuolated cells. With the clinical

impression of malignancy and a doubtful histological diagnosis of malignancy, 5-fluorouracil 750 mg intravenously per day were administered from the 5th to 14th post-operative day, together with penicillin G. sodium 2 mil. I.U. and streptomycin sulfate 1 gm I.M. per day during the first two post-operative weeks. The surgical specimen was reviewed and "sulfur granules" were identified, and the cellular picture of the perivesical tissue was chronic suppurative reactive process.

The third post-operative week was complicated by a *Klebsiella* urinary tract infection and partially disrupted surgical wound. Despite treatment with Colimycin the patient developed septic shock and died at the end of the fourth post-operative week.

At autopsy there was a moderate degree of jaundice with focal haemorrhages in the lungs, gastrointestinal mucosa, heart and thrombotic occlusions with recent infarcts in the right kidney. Sulfur granules were not seen in the autopsy specimen, but Gram stain and acid-fast stain of the tissue revealed in addition to Gram negative bacilli, a few Gram positive, acid fast negative diphtheroid cocco-bacilli in the lungs, kidney and surgical bed which were compatible with actinomycetes. Bacterial cultures and immunologic tests were not done.

At the time of autopsy a 0.4 cm in diameter subcutaneous tract was identified along the dorsal aspect of the shaft of the penis starting from the bifid glans penis, tracking underneath the symphysis pubis and ended in the perivesical fibrotic tissue. Communication with the urinary bladder cavity could not be identified. Histologically the accessory urethral tract was lined by transitional epithelium or columnar epithelium and surrounded by a few concentric layers of spindle cells. This tract was considered to be the route of infection in this case of actinomycosis of perivesical tissue. The development of this tract could probably result from either a reduplication of the penile urethra, or a vestigeal remnant of fused aberrant mesonephric ducts.

IMMUNOPATHOLOGY MECHANISMS IN PARASITIC DISEASES

V. HOUBA

WHO-Immunology Research and Training Centre, P.O. Box 30588, Nairobi, Kenya.

There is an increasing evidence that immunological phenomena play an important role in the pathogenesis of clinical manifestations of the parasitic diseases. Although both, humoral and cellular mechanisms of the immune response may initiate (and perpetuate) such lesions, much more attention has been given to humoral components, especially immune complexes and complement.

Immune complexes may be formed at the site of release of antigens, in circulation or in extravascular spaces. Circulating complexes may localize in filtering membranes of the vessels (vasculitis, glomerular lesions in kidney, choroid plexus etc.). Local formation of immune complexes may also be responsible for injury.

Complement can mediate tissue damage either by classical pathway (most cases) or by alternate pathway. However, non-complement mediators, such as Hageman factor pathways, kinins, prostaglandins, clotting and fibrinolytic systems should be kept in mind. Interactions of immune complexes with various surface receptors on cells (tissues ?) may significantly influence otherwise effective cellular mechanisms.

Cell-mediated mechanisms can also induce pathological lesions, - the best example being the formation of granulomas around the eggs trapped in liver, gut and other tissues in schistosomiasis.

SEASONAL RATES OF ACQUISITION AND LOSS OF HOOKWORMS AMONG CHILDREN IN RURAL WEST BENGAL

TED NAWALINSKI, G.A. SCHAD, V.K. KOCHAR and A.B. CHOWDHURY

The Johns Hopkins University ICMR, Calcutta and Calcutta School of Tropical Medicine, Calcutta, India.

A two-year study of the dynamics of hookworm infection in West Bengal disclosed a yearly turnover of about 60% of the mean female worm burden. The average child lost about 11.1 female hookworms during the 1969 postmonsoon dry period and gained about 10.3 females during the subsequent premonsoon and monsoon seasons; at least 4 of these represent newly-matured *Ancylostoma duodenale* females which had remained hypobiotic since they were acquired the previous season. From nematological and anthropological data, it was estimated that each child contacted about 250 larvae/season, or about 1.8 larvae/day. The efficiency of hookworms in penetration and maturation was estimated at 18% for *Necator americanus* and 5% for *A. duodenale*.