Paragonimus and paragonimiasis – A new focus in Arunachal Pradesh, India

Paragonimiasis is potentially a serious disease in many countries of the world and is caused by the lung fluke genus Paragonimus belonging to the family Troglostomatidae. Paragonimus infection in man is caused by eating of undercooked/raw, infected crabs and crayfishes, and affects at least 22 million people throughout the world.1 The public health and economic impact of paragonimiasis is considerable, in terms of morbidity and loss of productivity. It is often misdiagnosed as tuberculosis because of overlapping clinical manifestations including chest pain, cough and haemoptysis and confusing radiological findings in chest X-rays.2 No data are presently available on the occurrence of paragonimiasis in India except in Manipur. In Manipur human paragonimiasis is caused by P. westermani.3 During our survey on food-borne trematodes, we observed the habit of eating raw and undercooked crabs among the people of Arunachal Pradesh. On enquiry from local doctors, long-term treatment failures among clinically and radiologically diagnosed tuberculosis cases were reported. This prompted us to undertake the study on paragonimiasis in the state and we detected a new focus of this disease. Considering the public health importance of paragonimiasis and also its rarity the present report has been prepared.

A community-based survey was carried out in the Changlang District of Arunachal Pradesh during May–June 2002. It was found that 95% of local inhabitants had the habit of consuming crabs and crayfishes. These crabs were eaten mostly after roasting though occa-
Figure 1. a, Metacercariae of Paragonimus heterotremus encysting in the cephalothoracic muscles of fresh water crab Barytelphusa lugubris; b, Metacercariae of Paragonimus heterotremus isolated from the muscles of crab host. Ustained preparation; c, Adult Paragonimus heterotremus experimentally developed in Wistar rat; d, e, Eggs of Paragonimus heterotremus.

sionally, crabs and crayfishes were also consumed raw. An effort was made to find out the possible human infection with paragonimiasis. Stool samples from 188 individuals were collected in 10% formol saline in plastic containers from randomly selected households. Formal-ether concentration technique was used for detection of parasite eggs microscopically. Seven sputum samples were also collected from clinically suspected tuberculosis patients and were examined for Paragonimus eggs in 3% NaOH using the concentration technique. Out of 188 stool samples collected from people of the locality, two cases were found positive for the eggs of Paragonimus. One sputum sample, out of seven clinically suspected TB patients, was also found positive for Paragonimus eggs.

Freshwater crabs were also collected from a mountain stream of the area to ascertain the presence of infection in crabs. Metacercarial infection in the crab hosts was examined by compression of tissue pieces between two glass slides and by digestion technique using artificial gastric juice. Nineteen out of 32 (59.4%) Barytelphusa lugubris crabs collected were found infected with metacercariae of P. heterotremus species. No metacercarial infection was detected in Sartoriana spinigera (n = 50). The Paragonimus metacercariae collected from infected crabs were oval and measured 654 to 750 μm in length (mean = 717 μm, SD ± 45.3 μm) and 523 to 636 μm in maximum width (mean = 591 μm, SD ± 49.2 μm). The oval-shaped metacercaria is characteristic of P. heterotremus. The crab species Rangiana smithiana and Parathelphusa dugsastii from Thailand and Putamon smithianus, Sinolapatamon patelifer and Sinolapatamon denticleatum from China serve as natural crab hosts of P. heterotremus. The crab species Barytelphusa lugubris found in Arunachal Pradesh is a new host record for P. heterotremus. The intensity of infection in Barytelphusa lugubris crabs ranged from 15 to 1000 metacercariae (mean = 165 metacercariae per infected crab). Mean intensity of Paragonimus metacercarial infection in female crabs was 183.3 compared to 82.5 in case of male crabs. For confirmation and species identification of Paragonimus, metacercariae obtained from infected crabs were developed to adult flukes in experimental Wistar rats. The adult flukes recovered were fully mature and hundreds of Paragonimus eggs were detected in cystic contents and the uterus of the worms. The eggs measured 57.2–91.1 μm (mean = 78.4 μm, SD ± 7.5 μm) in length and 37.5–66.1 μm (mean = 49.2 μm, SD ± 5.8 μm) in maximum width. The adult worms were thick bodied, elongated and reddish brown in colour, measuring 5–8.5 × 2–4.5 mm. The two testes were lobed and irregular in shape and situated side-by-side in-between the ventral sucker and the posterior end of the body. The single ovary, slightly smaller than or equal to testis in size, is located behind the ventral sucker slightly towards the left. On this basis and the morphology of the typical metacercariae, these lung flukes were found conspecific with Paragonimus heterotremus.

In India, human paragonimiasis was first described in Manipur in 1982. Subsequently, 39 more cases of human paragonimiasis due to P. westermani were reported from Manipur. So far, human infection with P. heterotremus is reported from South China, Laos and Thailand. Infection with P. heterotremus in Arunachal Pradesh may be due to proximity of this region with South China from the zoogeographical point of view.

The occurrence of high infection rates in crabs with P. heterotremus metacercariae in Arunachal Pradesh and detection of indigenous cases of human infection indicate that paragonimiasis is endemic in this region. It is well known that in areas where both paragonimiasis and tuberculosis co-exist, diagnostic confusion can affect the control programmes of tuberculosis as well as of paragonimiasis, especially in this mountainous region. Due to public health significance of paragonimiasis, a comprehensive study is needed to throw some light on the extent and epidemiology of this disease in Arunachal Pradesh.

5. Cheesbrough, M., Medical Laboratory Manual for Tropical Countries, ELBS.
First record of charophytes from the Permian Barakar Formation of the Talchir Gondwana Basin, Orissa

The Gondwana deposits in the Talchir Basin, Orissa are subdivided into Talchir, Karharbari, Barakar, Barren Measure and Kamthi formations in ascending order. Of these, the Barakar Formation is economically most important for its coal reserves and is the best studied. It contains about 100 m exposed sequence of alternating sand, silt, clay and coal horizons. There are four regional coal seams within this unit. The present charophytes are obtained from the calcareous siltstone beds which occur exposed between the 3rd and 4th regional coal seams (upper part of the middle Barakar Formation) exposed near Kosala village, Angul District, Orissa (Figure 1). Gyrogonites are bulbiform (650–700 µm in length and 450–600 µm in width) with sharp but small conical apex and rounded base, five sinistrally-coiled spiral cells (80 µm to 100 µm across), concave, equatorial angle usually 10° to 15°, apical pore absent, basal plate clearly divided. The generic characteristics of Paracunneatochara such as bulbiform shape, conical apex, rounded base, five sinistrally-coiled spiral cells and low equatorial angle are observed in this form. This form possesses subtle differences in morphology from the type species P. jinxiensis Wang, in having less conical apex, divided basal plate and non-pyramidal but bulbiform shape. It is also

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Figure 1. Geological map of a part of the Talchir Basin, Orissa showing the fossil locality and local stratigraphic section marked with the fossil beds.