Palaeoepidemiology of schistosoma infection in mummies

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BMJ 1992;304:555-6

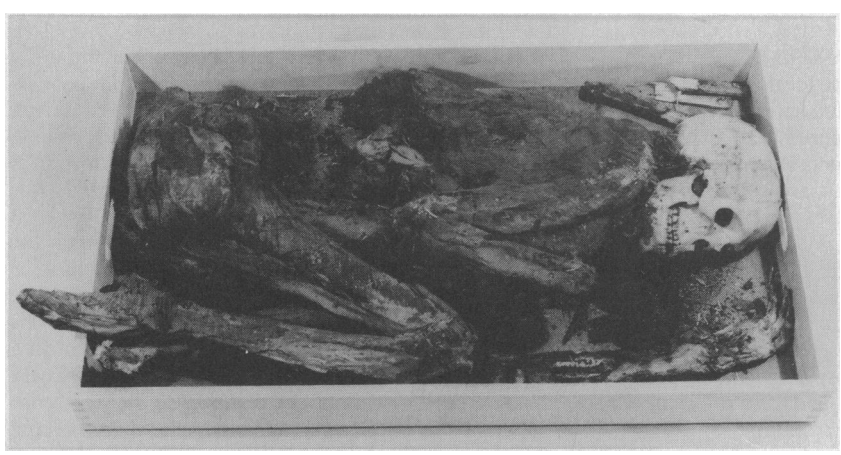
The earliest case of human schistosomiasis diagnosed at present occurred over 5000 years ago in an Egyptian adolescent from the Predynastic period (figure),[1] although the presence in palaeolithic sites in Africa of snail species now acting as intermediate hosts suggests earlier cases could be identified.[2]

We studied the presence of schistosome circulating anodic antigen in samples of desiccated skin or brain, or both, from 23 individuals recovered from the North Argin X-group (NAX) cemetery (Ballana period; AD 350-550) in the Wadi Halfa area, north of the second cataract on the river Nile in Sudanese Nubia.[3] The mummified remains in this study represent one of the most intensively studied skeletal populations in the world. The analysis of diseases indicates that the population suffered many of the ailments that plague us now: arthritis, trauma, benign and malignant neoplasms, nutritional deficiencies,[4] premature bone loss related to diet and lactation in women of reproductive age,[5] iron deficiency anaemia, and osteoporosis. Nubians were also shown to have ingested therapeutic doses of tetracycline from eating grain products contaminated with streptomyces.[6] In the present study, naturally desiccated Chilean mummy samples dated 2000 BC-AD 875 were used as negative controls.[1]

Circulating anodic antigen is a negatively charged, thermostable, genus specific proteoglycan.[7-9] This antigen is never present in uninfected individuals, and neither serum, urine, nor tissue of modern and ancient negative controls have given any false positive results,[10] suggesting a very high specificity of the assay used to detect the antigen.

Method

To detect circulating anodic antigen we used a sandwich enzyme linked immunosorbent assay (ELISA).[9] From each sample 150 mg of tissue was homogenised with phosphate buffered saline at 0°C, sonicated, and centrifuged at 25 000 *g* for 20 minutes.



Mummy of late predynastic adolescent (Egypt, approximately 3200 BC) in which schistosome circulating anodic antigen was detected

Schistosome circulating anodic antigen (CAA) in 23 naturally desiccated mummies recovered from cemetery (AD 350-550) in Wadi Halfa area, Sudan. Values >10 pg/mg indicate schistosomiasis

	Age (years)	Sex	Concentration of CAA (pg/mg tissue)	
			Skin	Brain
B678	30	Female	<2	
B654A	24	Female	<1	
B676A	29	Male	<1	
B631A			<0·3	
B670	1 or 2			<0·2
B676A	29	Male		<0·1
B682				<0·1
B692	>15	Female		<0·1
611A	>15	Female	323	
B687	25	Female	779	
B595B	30	Female	660	
B576C	30	Female	55	
B663A	37	Female	1208	
B675B	30	Male		20
B680	29	Male		103
B671	>50	Male		104
B675B	30	Female		259
B689A	30	Male		343
B643C	34	Male		20
B652	48	Female		16
B666B	23	Male	210	
B679	21	Male	14	
B676			61	

The supernatant was then mixed with 7·5% (wt/vol) trichloroacetic acid solution and spun down at 25 000 *g* for 20 minutes. The supernate was dialysed for 24 hours against distilled water (4°C) and lyophilised.[11] Concentrations of circulating anodic antigen per milligram of sample were calculated for each sample from a standard curve by using the fraction of adult worm antigen soluble in trichloroacetic acid; about 10% of this antigen is circulating anodic antigen.[10]

Results

All six negative controls had an antigen concentration of <0·1 pg/mg sample, and all values below a threshold of 10 pg/mg were considered negative in the present study. Fifteen cases of schistosomiasis were diagnosed in the mummies from the NAX cemetery, a positivity rate of 65% (95% confidence interval 46% to 85%). Concentrations of circulating anodic antigen in samples from schistosome infected individuals ranged from 16 to 1208 pg/mg (table).

Discussion

The amounts of antigen are highly dependent on the type of sample analysed.[1] Even taking into account the different types of sample used in this study (skin and brain), several samples tested obviously came from individuals who were heavily infected: their schistosome antigen concentrations were well over that of an adolescent New Kingdom weaver, Nakht, who is known to have been moderately to heavily infected with schistosome worms.[1,12]

Our sample represents a cross section of one of the

small rural communities that existed in the Wadi Halfa area around AD 350-550. Settlement in this part of Lower Nubia began during the Meroitic period (first century BC), when the introduction of the ox driven water wheel meant that water could be lifted to irrigate fields in an area where the lack of rainfall (<25 mm a year) and the deeply incised river channel had previously prevented cultivation by traditional means.[13] As agriculture in this region of Sudan was possible only with intensive water lift irrigation, conditions were well suited for snail vectors for schistosomiasis in irrigation channels in perennially irrigated fields, circumstances that still provide an important habitat for the intermediate host of the parasite.[13] Nowadays schistosomiasis is endemic in most inhabited parts of southern Egypt and northern Sudan. The positivity rate we found is within the range of modern rates of infection in the study area and other perennially irrigated areas of the Nile valley.

The application of a sensitive and specific immunological assay for schistosomiasis to mummies shows that with modern biomedical assays it is possible to move beyond the detection of isolated cases of ancient disease to determining trends in ancient public health.

This study received financial support from the research and development programme Science and Technology for Development of the European Community and from the Bioanthropology Foundation. We thank A Aufderheide of the University of Minnesota, Duluth, School of Medicine and also T Holden of the Institute of Archaeology, University College, London, for providing samples of Chilean mummy tissue.

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Romanian health and social care system for children and families: future directions in health care reform

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Government reforms and international relief efforts have brought about striking improvements in the care of Romanian children in institutions and have lessened the demand for institutional care. The immediate crisis has past, and Romania now faces the task of rebuilding its health and social care system for children and families.

We describe the characteristics of the Romanian health and social care system for children and future directions in health care reform. Data were derived from reports of international agencies on the status of children in Romania,[1,2] official (unpublished) statistics from the Ministry of Health of Romania, and a countrywide survey of randomly selected institutions for children age 0-3 conducted in 1991.[3]

Romanian child health and social care system

The Ministry of Health and local health authorities provide maternity and paediatric services through a network of hospitals, polyclinics, and dispensaries (primary care centres). Dispensaries are responsible for curative medical services as well as preventive services including prenatal care, growth monitoring of children, disease prevention, and home care follow up after the birth of a baby. In 1990 there were 5501 dispensaries, although only about half of these were under the authority of the Ministry of Health: the rest were connected to industries. There were 541 polyclinics and 424 district hospitals. There were six regional university teaching and referral centres for paediatric and maternity care.

In spite of relief efforts there continue to be shortages of basic equipment, supplies, and drugs, particularly at primary care level. Therefore, there is a tendency for dispensary personnel to overrefer patients to polyclinics or district hospitals for even minor health problems. Hospitals are poorly equipped and supplied, so lengths of stay tend to be long. Most paediatric hospitals have restricted visiting hours, which makes it difficult for parents employed in shift work to maintain contact with their children during hospital admissions. Paediatric hospitals may allow breast feeding mothers to stay on the wards with their children. However, parents of older children are generally not allowed to stay or participate in their children's care, in spite of severe nursing shortages.

Maternity hospitals generally do not allow rooming in. Babies are taken from their mothers at birth and given to the mother every three to four hours for breast feeding. Fathers are not allowed to visit.

There are no community based counselling or family support services. Income support for the poor is available but inadequate to meet the need. Each mayor's office employs a person or persons responsible for child welfare protection, but their main function is to determine the appropriateness of referrals for institutional care.

There are around 700 residential institutions for children in Romania. Administrative responsibility for children's institutions is divided and complex. The Ministry of Health is responsible for 112 institutions (*leagane* and dystrophic centres) for the care of children aged 0-3 years. *Leagane* are long term residential care institutions. They are not orphanages in the true sense but rather "child homes"—institutions where parents may place their children in temporary or permanent care. Dystrophic centres are hospital departments for

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BMJ 1992;304:556-9