THE THREAT OF HYDATID DISEASE TO THE SOUTH AFRICAN CITIZEN

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Despite the fact that our age is increasingly called upon to face many serious threats to our physical and psychological well-being, one should not be deterred from exposing yet another threat, even if it means causing alarm about an animal generally accepted as a friend to man.

The subject of this article is of vital interest to the South African citizen since it concerns a parasite which, for its very existence and propagation, is entirely dependent on sheep-raising and whose prevention is not so remotely impossible as is generally assumed.

Hydatid disease is the infestation of man by the larvae or cystic forms of the tapeworm *Taenia echinococcus*, and as yet it has failed to arouse the interest and vigilance of the medical profession and the lay public.

**MORPHOLOGY AND PATHOLOGY**

The history of the tapeworm *Taenia echinococcus* is probably as old as the history of mankind itself since both man and his domestic animals are vitally necessary for its existence and propagation; it needs two hosts—a definitive host and an intermediate host—to complete its life cycle.

The *definitive hosts*, which harbour the adult worm, are the dog, the jackal or silver fox, the hyena and all other members of the canine species. It does not reach maturity in the cat. The dog can be confidently implicated as the definitive host *par excellence*.

The *intermediate hosts*, in which the larval phase develops, include sheep, cattle, pigs, buffaloes and other herbivorous animals. In South Africa the sheep is the natural intermediate host and since the Union of South Africa has 38 million sheep, it is evident what enormous possibilities are present for the distribution of the larval phase, which is responsible for the perpetuation of the life cycle.

The adult worm, ¼ inch in total length, inhabits the small intestine of the dog; it consists of a scolex, i.e. a head and neck, and 3 proglottides, or self-contained ribbon-shaped pieces, attached; the entire worm resembling a partitioned ribbon. The scolex is round and has a rostellum with 30-60 hooks in 2 rows. Each hook when released from the scolex can develop into a hydatid cyst or other larval forms in the intermediate host. It also has 4 suckers by which it attaches itself to the inner lining of the host's small bowel. As in all tapeworms it is hermaphroditic, i.e. each separate segment has male as well as female sexual organs incorporated into it, and it fertilizes itself. Consisting as it does of 3 such segments, the first is immature, the second is sexually mature, and the third segment, which is about half the length of the entire worm and is gravid, i.e. pregnant, contains up to 50,000 eggs. This end is shed and passed in the faeces onto the soil and pastures, where each egg has remarkable powers of survival from 6 to 12 months outside its host's body. The sheep, its natural intermediate host, grazes over the contaminated pastures and ingests the eggs along with its feed. Man becomes infected accidentally by ingesting the eggs which get on to his hands from an infected dog's skin, paws and muzzle, or from dogs, uninfected internally, whose skin and hairy coats have been contaminated by rolling on sand patches on the farmyards contaminated with egg-laden dog faeces. The egg, by whatever means it gets onto man's hands, is eventually swallowed and absorbed in the small bowel along with digested foods and the larva passes into the portal circulation, which drains blood from almost the whole of the abdominal part of the digestive tube and digestive glands, and passes *via* the portal vein to the liver. The percentage incidence of hydatids in human organs was found in one series in Britain to be as follows: Liver 66, lungs 16, abdominal organs 8, cranial cavity 7, kidneys 7, bones 2.

Hydatid disease is liable to occur anywhere in the digestive tract, but the liver is most often infected in man. Here the larva settles down, most often in the right lobe of the liver, and causes cyst formation.

If the larva passes into the systemic circulation the hydatid has to go through the lungs, but it often settles down to cause hydatid disease of the lungs themselves.

Hydatid disease frequently occurs in the human brain (7%), mostly in the form of a cyst which causes an increased intracranial pressure. The unilocular cyst grows to a considerable size, distorting the cerebral architecture so that the patient may present with a great variety of neurological symptoms.

Among the 3 types of primary hydatids that occur in man are the following:

1. *The unilocular cyst*, which consists of an outer non-nucleated laminated layer 1 mm. thick, an inner nucleated germinal layer, and a fibrous outer covering where the organ is capable of reacting and producing such a sheath. Bud-like thickenings soon appear on the inner germinal layer and break off in loops from it to form vesicles or brood capsules. From 5 to 20 buds appear on the inner surface of their walls. These develop into invaginated scolices with 4 suckers and a double row of hooks and are the mature larvae; later on these brood capsules rupture and the scolices pass into the fluid of the original cyst to produce the "hydatid sand".

2. *Osseous cyst*. Enlargement of this cyst follows the line of least resistance and it can cause spontaneous fractures in limb bones and the vertebrae.

3. *Alveolar cyst*. This cyst is an irregular spongy mass of small irregular cavities filled with a gelatinous material resembling snails.

**TREATMENT OF HYDATID DISEASE IN MAN**

There is no effective non-surgical treatment for hydatid disease in man and radical surgery is the only treatment that can be offered. This implies accessibility of the cyst or cysts and the avoidance of spilling the contents of a cyst into the body cavities. When the cyst is in a limb bone, amputation is the treatment of choice.

Accessible cysts in the cranium are frequently successfully removed. Neuro-surgeons, emboldened by the array of antibiotics at their disposal do not hesitate to perform...
radical surgery on the brain for hydatids or for the scarring caused by them.

Prevention

Transmission of hydatid disease to man occurs by the ingestion of eggs of the tapeworm *Taenia echinococcus* from the skin or paws or mouth of dogs infected with the worm and the coat and skin of dogs that have been contaminated by rolling on egg-laden farm soil, or lawns. This latter aspect has been emphasized above and constitutes the threat to man. Infection may also occur from ingestion of uncooked vegetables or other foodstuffs contaminated with ova from dog faeces. One fact, however, is unequivocally clear, viz. that hydatid disease in man is caused by the dog, both directly and indirectly from articles contaminated by it. Dr. Alexander, Director of Veterinary research at Pretoria, issued a warning to South Africans not to fondle or caress dogs or stroke dogs' backs; close contact directly with the dog is here inferred, but the indirect aspect should not be lost sight of.

The farmer's dog is the most dangerous to man since it can directly cause an egg to be conveyed to one's hands or it can contaminate all the other dogs on the farm, domestic and parlour dogs included, with eggs of the tapeworm which they have dropped in their faeces on the lawns and other playgrounds of children.

The above has an ominous bearing on the incidence of human hydatid disease and the health and well-being of the South African citizen, for human infection occurs in early childhood when the child of 4-7 years old has not yet acquired that degree of personal hygiene and knowledge to safeguard himself. He becomes very fond of his dog, the legendary friend of man, which may also turn out to be the bearer of a most disastrous disease, manifesting itself 40 or 50 years later as hydatid scarring of the brain with epilepsy or mental deterioration or paralysis; or a lung infection with hydatid cysts.

**SLAKSIEKTE**

The name *slaksiekte* is given to hydatid disease taking the form of a perennial disease occurring in robust young lambs in this southern part of the Orange Free State and which periodically assumes an epidemic form. It has the following features:

1. The affected animal falls to the ground or hurts itself by falling against sharp edges of stones forming the wall of a kraal and in fact against anything in its vicinity, e.g., a stationary wheelbarrow.
2. It appears stupid and mentally blunted and does not appreciate its surroundings. It runs blindly into stone walls and objects around it, which has earned for the disease, with characteristic acuteness of the observant farmer, the name of *Malkopsiekte*.
3. The animal will be standing normally and will fall very suddenly on its back, all four limbs jerking for a time, and will then lie still, giving the farmer the impression that it is unconscious. After a time it gets up as if nothing had been wrong with it and walks away.

This description recalls the classic description of the epileptic state with grand-mal seizures in man. The bony head of such a sheep is usually soft and pulpy on its vault and if opened after the sheep is dead, is found to be full of gelatinous-like cysts which are called *slakke*—Afrikaans for ‘snails’, which they resemble.

An astute farmer, completely baffled by this disease, sent the head of a sheep’s carcass which had died from it to Onderstepoort Veterinary Research Institute at Pretoria for diagnosis. The report came back indicating that the head of the sheep’s carcass contained larvae of the tapeworm *Taenia echinococcus*, of which the sheep is the natural intermediate host.

The term ‘slaksiekte’ is also frequently used to denote other hydatid disease in animals and human beings.

**CONTRIBUTORY FACTORS TO THE INCIDENCE OF HYDATID DISEASE IN SOUTH AFRICA**

1. This disease, though of world-wide distribution, is most prevalent in sheep- and cattle-raising countries. In South Africa sheep raising constitutes one of the most profitable types of farming. The wool industry alone has contributed £850 million to our national income since 1910 and, apart from the wool industry, the meat industry has benefited because of the increased demand for mutton as a result of the phenomenal expansion of gold mining developments in the O.F.S. and Transvaal. Sheep raising, then, whether alone or in mixed farming, which probably is the more popular tendency, has become a major type of farming and, with all its associated conditions, assures the perpetuation of the tapeworm *Taenia echinococcus*.

2. Whereas sheep raising was formerly mainly confined to the Karoo and Karoo-type of veld (in all the provinces of the Union), it has now become an important and most profitable branch of farming to the wheat and maize growers.

3. The spread of hydatid disease is also favoured by the disappearance of a definite division between urban and rural life. It started with peri-urban areas which brought small holdings right up to the boundaries of our cities. Of the country’s small holdings, 64% are situated around Pretoria and the Witwatersrand as far as Vereeniging; in other words, 56,058 of the country’s 87,202 small holdings are in this area.

4. In country towns conditions are atrocious. Where abattoirs exist, butchers alone make use of them, while a great deal of slaughtering of sheep, pigs and cattle is done in the back-yard with local dogs doing the mopping up and eating meat which is given to them because it appears not fit for human consumption. This may be hydatid-infected meat, the pig and cattle also acting as intermediate hosts. In spite of the health inspector, meat of any description is clandestinely or openly hawked in the town and its location. I know of several farmers who have hawked carcasses of sheep which had died from *malkopsiekte*, i.e. hydatid of the brain and head, in the town and location in the belief that the head of the sheep is alone affected by this disease, when as a matter of fact the whole carcass is riddled with it.

5. Far too many dogs are kept in the country districts, and in towns as a whole, particularly in locations, where the unskilled African labourer though he can hardly afford to feed his family, still keeps more than one dog. The locations are overrun by underfed dogs which, singly or in packs, often joined by dogs from the town, raid and wantonly kill the sheep on farms.

6. Up-and-coming progressive young wealthy farmers have capitalized on the post-war wool boom, practising
improved methods of farming, so that the capital investments of the farmers in South Africa stand today at £20,000 million. They have built sumptuous dwellings on their farms with all the necessary and most modern conveniences formerly denied to them because of adverse and unstable farming trends. The homesteads are further adorned with spacious evergreen lawns and terraces of flower gardens interspersed. Convenient spaces are set aside for recreation and relaxation for adults and children, for they have set out to live comfortably and bring up children to the best of their ability, and in the tradition of their forefathers. Yet they are oblivious of the threat of hydatid disease, particularly to their children, which is presented by the infected dogs on the farm and by their pet dogs which, having the run of the house, play where the other farm dogs have polluted the ground.

The parents of children, especially stock farmers, should be on their guard concerning their children and dogs because, in humans, infection usually occurs at an early age, from 4 to 12 years, when a child becomes very attached to a dog and has not yet acquired those habits which might safeguard him against the hydatid infestation of which the dire results may not manifest themselves until many years later. As a student I witnessed in Groote Schuur Hospital a craniotomy performed by the late Mr. T. Lindsay Sandes on a highly-ranked employee of a commercial bank, a man in his early forties who had grown up on a sheep-raising farm in his youth. He was struck down by attacks of symptomatic epilepsy caused by hydatid disease of the brain. The skull was opened by turning down a flap of bone and cysts came away from his brain like grapes or gelatinous bubbles resembling snails; hence I presume the Afrikaans description of it as slaksiekte.

7. The echinococcal infection comes with the dogs which the farmers bring with them to the seaside and other holiday resorts. The infected dogs foul the beaches and lawns with their faeces, and in this way children playing there may be directly infected, or uninfected dogs may pick up the ova on their coats, paws and skins and take the infection home to their owners. In this way infection is brought from the farms to the seaside resorts throughout the coast of South Africa. Many farmers have their own seaside houses, to which they take their dogs.

A disquieting feature of this farmdog-man relationship is the indifference and total disregard for the preventive aspect of hydatid disease on the part of the laity and medical people alike. For instance a physician I know, who lives in the Karoo just inland from a small seaside resort, comes on weekends down to the sea with his wife and small children and often squeezes the huge family dog into the already overcrowded car.

8. Sheep raising however, has its adversities. There is for instance the loss of sheep due to stock diseases, which is fortunately very satisfactorily countered by the ever vigilant and resourceful Veterinary Research Station at Pretoria. But sheep loss due to their destruction by wild animals constitutes the major problem to the stock farmer, 600 sheep being lost this way daily in the Union. The animals more generally accepted as responsible for this killing of sheep are silver fox, jackal, underfed dogs and in mountainous areas, leopards, cheetahs, wild baboons and wild cats. The farmer's dogs are an essential in the campaign against these animals.

The silver fox remains public enemy number one to the sheep farmer who has even gone so far as to have the confines of his farm enclosed by vermin-proof wire-netting fencing, an ideal counter to preserve his flock of sheep, which also prevents his stock from straying or being chased away. It is, however, an expensive undertaking and not all farmers are financially strong enough for such a capital expenditure.

A special Act of Parliament is in force which makes credit available through the Land Bank to farmers for fencing their farms with vermin-proof fencing. There are branches of the Bank at Cradock and Beaufort West, the richest and best sheep-farming districts in the Union. At the beginning it was a very expensive undertaking, the outlay on fencing at times exceeding the value of the farm; but the far-sighted objective has fully justified itself, making farming easier, preventing soil erosion, and checking the activities of the silver fox and other destructive animals. However, despite the great number of farms fenced in this way and the capital expenditure on vermin-proof fencing, the silver fox remains the greatest menace to the sheep farmer, his killing of sheep going on unchecked. His exploits are legendary and it is now believed that he can climb over the wire netting of a fence. The fact remains that no satisfactory device has been devised to foil the fox. The only reliable and effective method is to use the dog for tracking the fox to its lair, to destroy the whole litter or to hunt it in the open with dogs.

Organized campaigns are permanently maintained by agricultural bodies with the support of the Government, and a fee is paid for the skin of a silver fox.

Each district in the Union is divided into several Jackal Clubs and a dog registered in the Club is exempt from dog taxation. Dogs are specially kept and bred on farms for this purpose, including greyhounds, fox-terriers and others. Dogs kept by the farm hands are also registered along with the farmer's dogs in the Club books and are tax free.

SUMMARY

The object of this article is to demonstrate the danger in South Africa of hydatid disease conveyed to man by dogs infected with echinococcal tapeworm or contaminated with its ova. Emphasis is laid on the part played by sheep-farm dogs and whose coats, paws, etc., have been contaminated with their faeces.

The sheep being the intermediate host, the growth of sheep farming in this country has promoted the spread of the disease.

The morphology and pathology of the disease are briefly described, as well as its treatment and preventive measures. Other factors contributing to its incidence are referred to, including farming operations on small holdings in peri-urban areas, and the uncontrolled slaughtering of sheep, pigs and cattle in country towns.

Stress is laid on the unhygienic contact that takes place between dogs and members of their owners' families, and the increased risk of the spread of hydatid disease that arises from the practice of bringing dogs from sheep farms to seaside and other holiday resorts.

REFERENCE