



## RESEARCH ARTICLE

### Swine kidney worm in Bangladesh: An abattoir survey

Ausraful Islam<sup>1\*</sup>, Anisuzzaman<sup>1</sup>, Jhunu Rani Roy<sup>1</sup>, Md. Golam Yasin<sup>1</sup>, Sharmin Shahid Labony<sup>1</sup>, Md. Mokbul Hossain<sup>2</sup>, Md. Abdul Alim<sup>1</sup>

<sup>1</sup>Department of Parasitology, <sup>2</sup>Department of Pathology, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh  
Received: 31.05.2015, Accepted: 06.07.2015  
\*rajibdvmpara@gmail.com

### Bangladeş'te domuz böbreğindeki kurtlar: Bir mezbaha araştırması

Eurasian J Vet Sci, 2015, 31, 4, 222-226  
DOI: 10.15312/EurasianJvetSci.2015413527

#### Öz

**Amaç:** Bu araştırmada mezbahada kesilen domuzlarda post-mortem muayene sonrasında böbreklerinde kurt varlığı patolojik ve prevalans olarak değerlendirildi.

**Gereç ve Yöntem:** Mezbahalardan domuzların iç organlar toplandı. Böbrekler, peri-renal yağlar, üreterler, akciğerler, karaciğerler ve lenf yumruları makroskopik ve mikroskopik lezyonlar yönünden incelendi.

**Bulgular:** 76 domuzun 16 (%21)'sının enfekte olduğu belirlendi. Böbrek korteksi, perirenal yağlar, üreter ve böbrek pelvisinde olgun parazitlerin varlığı belirlendi. Makroskopik olarak kanlı-şişkin ve yüzeyinde krem-beyaz renkte odaklar bulunan böbrekler gözlendi. Böbrek çevresi yağ doku ve ilişkili diğer dokularda nekrotik odaklar ve kanlı alanlar tespit edildi. Histopatolojik incelemede böbrek paransim dokuda yoğun eozinofil infiltrasyonu gözlendi. Ayrıca, nefritisle ilişkili nötrofil ve mononükleer hücre varlığı belirlendi. Birçok vakada perirenal dokuda gömülü olarak parazit parçaları gözlendi.

**Öneri:** Domuzlarda böbreğin normal yapısının bozulmasında, böbreklerde görülen kurtlar ciddi bir problem oluşturmaktadır.

**Anahtar kelimeler:** Domuz, böbrek kurdu

#### Abstract

**Aim:** Prevalence and pathologic aspects of kidney worm infection in indigenous pigs were described after post-mortem examination.

**Materials and Methods:** Viscera of the pigs from the slaughter houses were collected. Kidneys, peri-renal fats, ureters, lungs, liver and mesenteric lymph nodes were examined for both gross and microscopic lesions.

**Results:** Of the 76 pigs 16 (21%) were infected with the worm. Adult parasites from renal pelvis, ureter, peri-renal fats and from renal cortex were recovered. Grossly, the affected kidneys were swollen, congested and marked with creamy-white necrotic foci visible from the surface. Peri-renal adipose and connective tissues were also congested and marked with necrotic foci. Histopathological studies revealed massive infiltration of the renal parenchyma mainly with eosinophils, however, some neutrophils and mononuclear cells were also detected, suggesting interstitial nephritis. In most of the cases, cross-sections of embedded parasites were observed in peri-renal tissues.

**Conclusion:** Swine kidney worm is a serious problem in pig that causes severe distortion of renal normal architecture.

**Keywords:** Swine, kidney worm





## Introduction

Pigs are the fast growing and one of the most prolific livestock and pork is the most popular meat in the world (Phokan et al 2006, Durranc and Maxson 2008, Prakash et al 2008). Pigs are considered as the richest source of high quality animal protein at a lower cost for the people who consume pork. The sustainable development of pig industry faces a number of constraints, of which the diseases caused by helminth parasites are notables. Parasites are responsible for extensive loss of productivity in swine as they constitute a major impediment to efficient and profitable livestock production (Boes et al 2000, Joachim et al 2001). *Stephanurus dentatus* (Nematoda: Strongyloidea), popularly known as the swine kidney worm, is one of the major threats to pig industry. Adult *S. dentatus* is a, strong and stout nematode measuring about 2- 4 cm long and about 2 mm in diameter. They are usually found in pairs within cysts up to 4 cm in diameter in the kidney and perirenal fat. Larvae may be found in the liver and occasionally in other tissues or organs such as lymph nodes, lungs, stomach wall and washing of the body cavity (Soulsby 1982).

Swine kidney worm infection is more common in pigs reared in traditional backyard system. The higher prevalence of the worm in the traditional system is associated with factors such as continuous exposure to infective stages of parasites from premises, scavenging behavior of pigs and the presence of paratenic hosts (earthworm) in the soil (Roepstorff and Nansen, 1994). Usually, eggs of this helminth pass out through urine and hatch within 2 days. Eggs may rapidly develop to infective third-stage larvae, but the different larval stages are very sensitive to desiccation. Infective larvae mainly infect pigs percutaneously or per os with contaminated food. In addition, earthworms may ingest and accumulate larvae (Stewart and Hoyt 2006). Consequently, pigs may acquire infections by eating earthworms during scavenging. Prenatal infection has also been reported among the piglets. Patent infections in piglets less than 5 months old are acquired prenatally. After getting entrance, the larvae migrate via blood vessels to the liver where they wander for 3 months or more. The larvae proceed to migrate through the peritoneum to the kidney where the cysts are formed. Eggs do not appear in the urine until 9-16 months after infection. Female worms live as long as 3 years and produce up to 1 million eggs per day (Soulsby 1982). High worm burden causes considerable damage in the renal parenchyma affecting health and productivity evidenced by stunted growth. Adult worms can cause extensive damage of the kidney tissue. However, the migrating larvae can cause severe damage in the liver resulting cirrhosis, scar formation and extensive thrombosis of the portal vessel. Lung damage by migrating larvae is also encountered. Pleuritis and peritonitis are also common outcomes of this parasitic infection. Clinically, the infection is manifested by inappetance, emaciation, and ascites. Death can result

from heavy infections with kidney worm (Leman et al 1981). The principal economic loss results from condemnation of organs affected by adult parasites and migrating larvae as well. *S. dentatus* has also been reported from cattle and donkey. The parasite is widely distributed in tropical and sub-tropical countries (Illanes 2012).

This study was conducted to describe prevalence along with the pathologic aspects of swine kidney worm infection in local pigs of Bangladesh.

## Materials and Methods

A total of 76 viscera of slaughtered pigs were examined. Fresh viscera was collected just after slaughtering, and brought to the Helminthology Laboratory of the Department of Parasitology, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh. Visceral organs such as kidneys, peri-renal fats, ureters, lungs, liver and mesenteric lymph nodes were examined carefully by close inspection and simultaneous digital palpation to detect parasites, and associated tissue damage and changes.

Embedded parasites were gently removed from the affected organs. After collection, parasites were carefully washed in phosphate buffered saline (PBS) and preserved in 70% glycerin alcohol. Temporary slides of the parasites were prepared using lectophenol to visualize the internal organs and morphological study under microscope according to the keys and description given previously (Soulsby 1982). Photographs were taken by digital camera. Male and female parasites were measured to determine their length and width. Eggs were recovered directly from the gravid uteri of the parasites and measured using ocular micrometer fitted in a microscope.

Suspected tissues from the affected kidneys and peri-renal fats were separated carefully and examined for the detection of lesions, if any, produced by the parasite. Collected tissues were fixed in buffered neutral formalin overnight and washed in PBS three times. Fixed tissues were processed, paraffin-embedded, and thin (3  $\mu$ m) sections were made. Thereafter, the sections were subjected to routine histopathological studies staining with Hematoxylin and Eosin (H&E) following standard procedure (Luna 1968).

## Results

Totally 16 (21%) of 76 pigs were found infected with swine kidney worm, *S. dentatus*. The pigs we sampled aged between 1-5 years. Swine kidney worms were recovered only from older animals (age  $\geq$ 4 years). Total parasite recovered ranged from 1-25 per animal. Morphologic and morphometric analyses of the collected parasites were performed by two independent parasitologists. Detail analyses revealed that the

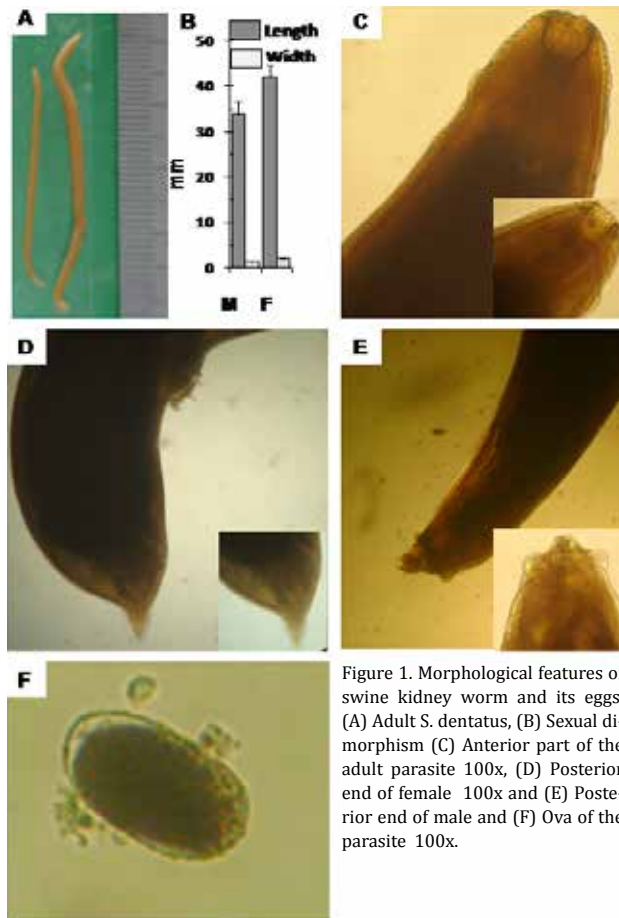


Figure 1. Morphological features of swine kidney worm and its eggs. (A) Adult *S. dentatus*, (B) Sexual dimorphism (C) Anterior part of the adult parasite 100x, (D) Posterior end of female 100x and (E) Posterior end of male and (F) Ova of the parasite 100x.

collected parasite was the adult stage of *S. dentatus*. Freshly collected parasites were brown to light ash in color and very strong and stout in appearance. Clear sexual dimorphism exhibited in males and females. Females were longer (39.0-44.0 mm) and thicker (1.98-2.6 mm) than males measuring 30.5-36.0 mm and 1.21-1.4 mm length and width, respectively (Figure 1A, B). The perioral rim was little bit dark and thick, with leaf-crown. The buccal capsule was cup-shaped and variable sized teeth were present. Esophagus of the parasite was thin anteriorly and slightly thick posteriorly (Figure 1C). Tail of the female tapered abruptly to a point and vulva opened close to anus (Figure 1D). In male bursa was small with short rays having three distinct lobes, two lateral lobes and one dorsal lobe. Specules were equal and similar and 0.70-0.98 mm in length. (Figure 1E). We also recovered eggs directly from the gravid uteri. Eggs were broad ellipse, thin shelled with 32-64 blastomeres. Eggs were measured as 85.2-99.4  $\mu$ m long and 56.8  $\mu$ m wide (Figure 1F).

It was recovered the adult parasites from renal pelvis, ureter, peri-renal fats and also from renal cortex (Figure 2A-D). Parasites were found both in encysted and free conditions. Cysts contained foul smelling greenish pus. Multiple grey colored elevated necrotic foci visible from the surface were present in the affected kidneys. Affected kidneys were swollen characterized by enlarged size and tensed capsule (Fi-

gure 2A, B). Visible purulent mass was found mostly in the renal cortex, which sometimes extended up to the medullary tissues. In peri-renal fats, necrotic foci of various sizes were present containing greenish pus and the embedded parasites. In some cases, parasites were surrounded by thick fibrous cystic wall containing creamy cheese like caseous mass. Histopathological studies revealed focal interstitial nephritis with the accumulation of eosinophils, lymphocytes and macrophages. Edema fluid and hemorrhage were also evident in those sections (Figure 3 A-D). Cross-section of parasite associated with pyogranuloma was found in the peri-renal fats (Figure 4).

## Discussion

Pigs are cheaper source of animal protein among the pork eating community worldwide. In Bangladesh, pork is used in many food items of tribal and non-muslim people living scatteredly throughout the country, especially, in higher population at the northern and central region of the country.

Probably higher prolificacy, ability of the pigs to collect their own food even from garbage and higher growth rate have made pig rearing popular among them. However, the backyard pigs suffer from different parasitic diseases (Islam et al 2005, Islam et al 2006a, Islam et al 2006b, Islam et al 2008, Sardar et al 2012). Here, we identified *S. dentatus*, the swine kidney worm, and describe its prevalence and the pathological consequences of the infection in detail, to our knowledge, for the first time in Bangladesh.

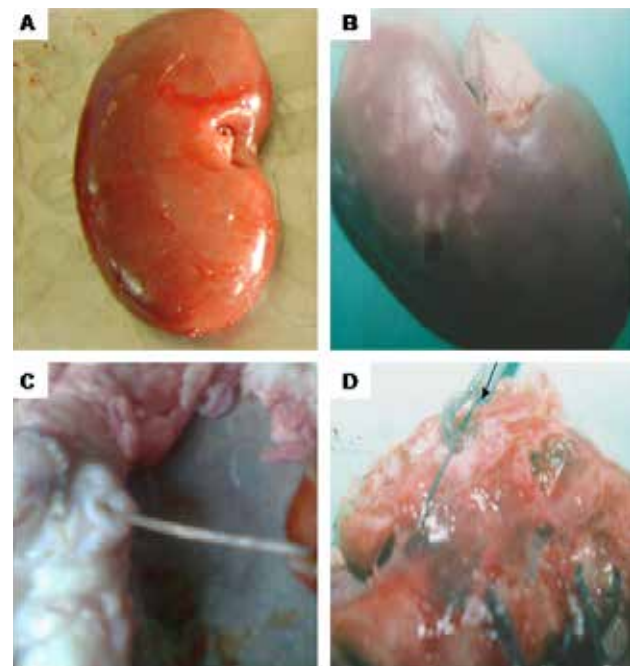


Figure 2. Gross changes in the affected organs with embedded parasite. Suspected organs were separated carefully and examined. (A) Normal kidney, (B) Affected kidney with lesions, (C) *S. dentatus* attached in the ureter (D) *S. dentatus* in the peri-renal fat.



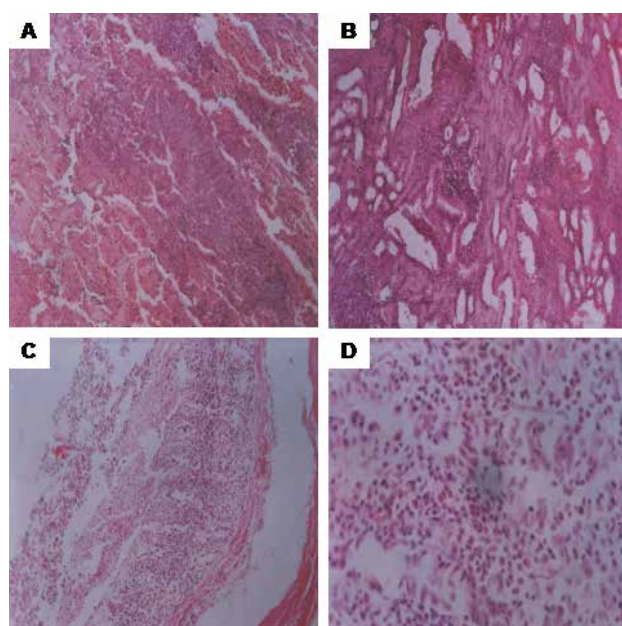


Figure 3. (A, B, C) Interstitial nephritis at 10x and (D) Interstitial nephritis at 40x.

From the morphologic and morphometric analyses, both the independent parasitologists confirmed the species as *S. dentatus*. The description and identifying land marks confirmed to those given by some others parasitologists (Soulby 1982). From the study, we were confident enough to identify the parasite down to species.

Prevalence of the swine kidney worm was fairly high (21%) in Bangladesh. Studies have shown that poor hygienic conditions in most traditional systems allow a higher prevalence, burden and rate of helminths transmission while infection levels in the highly intensive production system are usually low and involve only a few species (Nansen and Roepstorff 1990, Kagira et al 2002, Ng'ang'a et al 2008). Presence of *S. dentatus* is considered as a marker of poor management (Gibbens et al 1989). In India, 1154 pigs from different abattoirs were examined and 467 (40.50 %) of them were found to be positive for *S. dentatus* (Singh and Kaushal 1995). In Belize, 137 pigs were examined and 42% of them were positive for *S. dentatus* (Gibbens et al 1989).

Disparity between present and previous studies might be due to differences in geographical location, managements and method of studies. Presence of wild pigs in the same premise also favors the higher prevalence of helminths, including swine kidney worm in domestic pigs (Nissen et al 2011). Fortunately, bushes and jungles present in the study areas were free from wild pigs. We found the parasite only in adult pigs, which suggest that age of the host might act as a key determinant of the infection. The parasite destroyed the normal architectures of the renal parenchyma; especially in heavy infection. Illanes (2012) reported similar pathological changes.

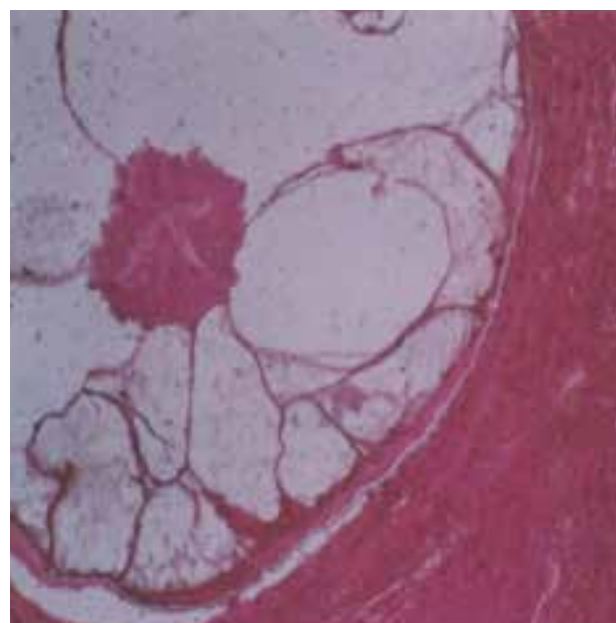


Figure 4. Pyogranuloma in the peri-renal fat with cross-section of parasite.

## Conclusion

Kidneys play key role in the excretion of metabolic wastes of the body such as creatinine, blood urea nitrogen, urates and others. Kidneys also have significant roles in the water balance, erythropoiesis, acid-base balance, regulation of blood pressure and heat regulation. Due to destruction of the functional tissues of the kidneys, induced by the worms, the metabolic wastes retain in the body and animal suffer from unthriftiness and inappetence resulting in catabolic state of the body physiology. Thus, growth of the affected animals obviously is much lower than the expected, and badly affected animals even may die. Taken together, our results suggest that swine kidney worm is a big threat in pig rearing in Bangladesh. Our base line data will help to increase public awareness. We also need to formulate preventive measures to protect other livestock such as ruminants from the devastating effects of the parasite. Further studies are required to know the detail epidemiology and economic impact of the parasites in the pig industry of Bangladesh.

## Acknowledgements

We are grateful to Bangladesh Agricultural University, Mymensingh for providing facilities to conduct this research.

## References

- Boes J, Willingham AL, Shi FH, Hu XG, Eriksen L, Nansen P, Stewart TB, 2000. Prevalence and distribution of pig helminths in the Dongting Lake Region (Human Province) of the People's Republic of China. *J Helminthol*, 74, 45-52.



- Durranc L, Maxson CA, 2008. Swine production on a small scale. *J Anim Sci*, 23, 523-557.
- Gibbens J, Gibbens N, Fielding W, 1989. An abattoir survey of the prevalence of gastro-intestinal helminths and *Stephanurus dentatus* in pigs in Belize. *Trop Anim Health Pro*, 21, 197-204.
- Illanes O, 2012. Urinary Tract Pathology: *Stephanurus dentatus*. Western Conference of Veterinary Diagnostic Pathologists, Calgary, Alberta, pp: 1.
- Islam A, Anisuzzaman, Majumder S, Rabbi AKMA, Hossain MM, 2008. Prevalence and pathology of helminth infections in pigs. *Pakistan J Sci Ind R*, 51, 317-322.
- Islam A, Majumder S, Anisuzzaman, Rabbi AKMA, Rahaman MS, Rahman MH, 2006b. Prevalence and pathology of ticks and lice of pigs in relation to age and management systems in Bangladesh. *Intl J Bio Res*, 1, 22-27.
- Islam A, Majumder S, Anisuzzaman, Rabbi AKMA, Rahman MH, 2006a. Helminthiasis in pigs in Bangladesh: in relation to age and management systems. *Bang Vet J*, 40, 27-37.
- Islam A, Rabbi AKMA, Rahman MH, 2005. Occurrence of parasites in pigs in Tangail district in Bangladesh. *Bangl Vet*, 22, 99-101.
- Joachim A, Dulmer N, Dangschie A, Roepstorff A, 2001. Occurrence of helminths in pig fattening units with different management systems in Northern Germany. *Vet Parasitol*, 96,135-146.
- Kagira JM, Kanyari PWN, Munyua WK, Waruiru RM, 2002. The prevalence of gastrointestinal parasites in commercial pig farms in Thika district, Kenya. *Bull Anim Health Prod Afr*, 50, 1-11.
- Leman AD, Glock RD, Mengeling WL, Penny RHC, Scholl E, Straw B, 1981. *Diseases of Swine*. Iowa State University Press, Ames, Iowa, USA, pp: 386-575.
- Luna LG, 1968. *Manual of Histologic Staining Methods of the Armed Forces*, Institute of Pathology. McGraw Hill Book Co, New York, USA, pp: 35-50.
- Nansen P, Roepstorff A, 1999. Parasitic helminths of the pig: Factors influencing transmission and infection levels. *Int J Parasitol*, 29, 877-891.
- Ng'ang'a CJ, Karanja DN, Mutune MN, 2008. The prevalence of gastrointestinal helminths infections in pigs in Kenya. *Trop Anim Health Pro*, 40, 331-334.
- Nissen S, Paulsen I, Nejsum P, Olsen A, Roepstorff A, Rubaire A, Thamsborg S, 2011. Prevalence of gastrointestinal nematodes in growing pigs in Kabale District, Uganda. *Trop Anim Health Pro*, 43, 567-572.
- Phookan A, Laskar S, Aziz A, Goswami RN, 2006. Reproductive performance of indigenous pigs of the Brahmaputra Valley of Assam. *Tamilnadu J Vet Ani Sci*, 2, 121-125.
- Prakash MG, Ravi A, Kumari BP, Srinivas RD, 2008. Reproductive and productive performance of crossbred pigs. *Indian J Anim Sci*, 78, 1291-1297.
- Roepstorff A, Jorsal SE, 1990. Relationship of the prevalence of swine helminths to management practices and anthelmintic treatment in Danish Sow herds. *Vet Parasitol*, 36, 245-247.
- Roepstorff A, Nansen P, 1994. Epidemiology and control of helminth infections in pigs under intensive and non-intensive production systems. *Vet Parasitol*, 54, 69-85.
- Sardar SA, Chakma D, Anisuzzaman, Hossain K, Islam A, 2012. Helminthiasis in the pigs of Rangamati district of Bangladesh. *Eurasian J Vet Sci*, 28, 233-236.
- Singh K, Kaushal P, 1995. Studies on the prevalence of the swine kidney worm *Stephanurus dentatus* in Rohilkhand Division of Uttar Pradesh (India). *Vet Res Commun*, 19, 131-134.
- Soulsby EJJ, 1982. *Helminths, Arthropods and Protozoa of Domesticated Animals*. Bailliere Tindall, London, UK, pp: 140-160.
- Stewart BT, Hoyt PG, 2006. Internal parasites of swine, in: *Diseases of Swine*, Eds; Straw BE, Zimmerman JJ, Allaire SD, Taylor, JD, Ames, Iowa, USA, pp: 901-910.

