

Sertoli cell tumor in a boar: Pathological and immunohistochemical comparison with canine cases

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Abstract

Sertoli cell tumors (SCTs) are sex cord–stromal tumors of the testis that are common in dogs but rare in boars. This study characterized the pathological features of an SCT in a boar and compared its immunohistochemical profile with that of canine SCTs. Testicular tissues from boars (SCT, n = 1; normal testes, n = 2) and dogs (SCT, n = 3; normal testes, n = 5) were evaluated by histopathology and immunohistochemistry for proliferating cell nuclear antigen (PCNA), vimentin, and cytokeratin. Gross examination revealed a solitary, well-circumscribed nodule in the left testis of the boar, accompanied by severe bilateral testicular atrophy and interstitial fibrosis. Histologically, the neoplastic Sertoli cells were elongated and arranged in a palisading pattern along the seminiferous tubular basement membrane, with no evidence of local invasion. Immunohistochemically, vimentin showed cytoplasmic immunoreactivity in both normal and neoplastic Sertoli cells of boars and dogs. Strong nuclear PCNA immunoreactivity was detected in neoplastic Sertoli cells of both species, whereas cytokeratin expression was absent in all tissues examined. To our knowledge, detailed immunohistochemical characterization of SCTs in boars has rarely been reported. These findings indicate that the SCT in this boar was a benign neoplasm and exhibited immunohistochemical features comparable to those observed in canine SCTs.

Keywords: boar, cytokeratin, immunohistochemistry, PCNA, Sertoli cell tumor, vimentin

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Introduction

Testicular tumors are generally classified into germ cell tumors and sex cord-stromal tumors, the latter including Sertoli cell tumors (SCTs) and interstitial (Leydig) cell tumors (McLachlan and Kennedy, 2002). In dogs, the three major testicular tumor types, seminoma, Leydig cell tumor, and Sertoli cell tumor, occur at relatively similar frequencies and may even coexist within the same individual (Nødtvedt *et al.*, 2011).

Although histopathological examination remains the gold standard for diagnosis, immunohistochemistry (IHC) is an important adjunctive technique for confirming the cellular origin of these neoplasms. Vimentin is consistently expressed in both normal and neoplastic Sertoli cells, whereas cytokeratin expression is generally absent or shows variable immunoreactivity (Yu *et al.*, 2009; Cheville *et al.*, 2000). In addition, proliferating cell nuclear antigen (PCNA) is a well-established marker of cellular proliferation and has been reported to exhibit strong nuclear expression in canine testicular tumors (Papaioannou *et al.*, 2009).

In swine, testicular neoplasms are considered uncommon, largely because commercial boars are typically slaughtered before reaching the age at which neoplastic lesions are likely to develop. Nevertheless, recent systematic histopathological investigations suggest that these tumors may be underdiagnosed. A recent study of infertile boars identified seminoma as the most prevalent testicular tumor, particularly when diagnosed by histopathological examination (Ausejo *et al.*, 2025). In contrast to dogs, reports of SCTs in boars are exceedingly rare, with only a few published cases describing malignant tumors with metastatic spread (Mabara *et al.*, 1990). Consequently, the histopathological and immunohistochemical characteristics of porcine SCTs remain poorly defined.

The present study describes a rare case of a Sertoli cell tumor in a boar and compares its pathological and immunohistochemical features with those of canine SCTs. By characterizing this uncommon neoplasm, this study expands the current knowledge of porcine SCTs and contributes to a better understanding of their pathological features and immunophenotype.

Materials and Methods

Reproductive organs, including the testes, epididymides, seminal vesicles, prostate gland, bulbourethral glands, penis, and prepuce, were collected from a boar with a Sertoli cell tumor (SCT). In addition, normal testicular tissues were collected from two boars at slaughterhouses in western Thailand. Normal canine testicular tissues (n = 5) were obtained from dogs undergoing routine castration at the Department of Obstetrics, Gynaecology and Reproduction, Faculty of Veterinary Science, Chulalongkorn University. All specimens were fixed in 10% neutral buffered formalin and routinely processed for histopathological evaluation. Testicular specimens from three dogs with SCTs, retrieved from the archival formalin-fixed, paraffin-embedded tissue collection of

the Department of Pathology, Faculty of Veterinary Science, Chulalongkorn University, were also included in this study.

For immunohistochemistry, 4- μ m paraffin sections mounted on silane-coated slides were deparaffinized and subjected to heat-induced antigen retrieval in sodium citrate buffer (pH 6.0). Endogenous peroxidase activity was blocked with 3% hydrogen peroxide, followed by blocking of non-specific binding with 1% bovine serum albumin. Sections were incubated overnight at 4°C with primary antibodies against PCNA (monoclonal, dilution 1:200, Dako, Denmark), cytokeratin (monoclonal, dilution 1:250, Dako, Denmark), and vimentin (monoclonal, dilution 1:50, Dako, Denmark). Immunoreactivity was visualized using the EnVision system (Dako, Denmark) with 3,3'-diaminobenzidine as the chromogen and counterstained with hematoxylin. Immunolabeling was semi-quantitatively scored as weak (+), moderate (++), or strong (+++).

Results and Discussion

A Sertoli cell tumor (SCT) was identified in a culled boar; however, information on its breed, age, and reproductive history was not available. Nevertheless, examination of the reproductive organs indicated that the animal was sexually mature. Both testes (left: 167 g; right: 198 g) were severely atrophic; this case had previously been included in a study on testicular atrophy (Teankum *et al.*, 2013). Grossly, the cut surfaces of both testes were dark and non-protruding, with multiple white streaks extending between the mediastinum testis and the inner layer of the tunica albuginea (Fig. 1), possibly reflecting prominent fibrous testicular septa. Compressed white areas (approximately 2 cm in diameter) were observed near the caudal pole of both testes. The tumor appeared as a solitary, well-circumscribed, white-tan nodule measuring approximately 1.5 cm in diameter within the left testis (Fig. 1A). The left epididymis weighed 181 g and exhibited mild edema of the head. Sectioning of the epididymal tail yielded no fluid, indicating low sperm production; however, the precise etiology of the edema in the epididymal head could not be identified. The right epididymis weighed 143 g, and a small amount of fluid was expressed upon sectioning of the epididymal tail. The scrotal skin was dark and contained two small nodules (approximately 0.5 cm in diameter). No significant lesion was observed in other reproductive organs of the SCT-affected boar. Gross examination of the normal boars' testicular tissues revealed sexual maturity and no significant lesions.

Histologically, the tumor observed in the boar was well encapsulated and composed of variably sized tubules supported by abundant fibrous stroma. Neoplastic cells were densely packed, with round to ovoid basophilic nuclei and elongated eosinophilic cytoplasm, arranged perpendicular to the basement membrane of the seminiferous tubules (Fig. 2A). Mitotic figures were not observed. The adjacent testicular tissue showed severe degeneration and atrophy with marked interstitial fibrosis. Multifocal, moderate lymphocytic infiltration was observed

within the interstitium. The contralateral testis was severely degenerated, and the grossly observed white areas corresponded to marked interstitial fibrosis and seminiferous tubular atrophy. Multifocal lymphocytic infiltration was also present within the interstitium. In both epididymides, small amounts of spermatozoa

were observed within the lumen of the epididymal tails. In the scrotal skin, a small focal area of vascular proliferation was observed within the dermis. No significant histopathological lesions were observed in the remaining organs examined.

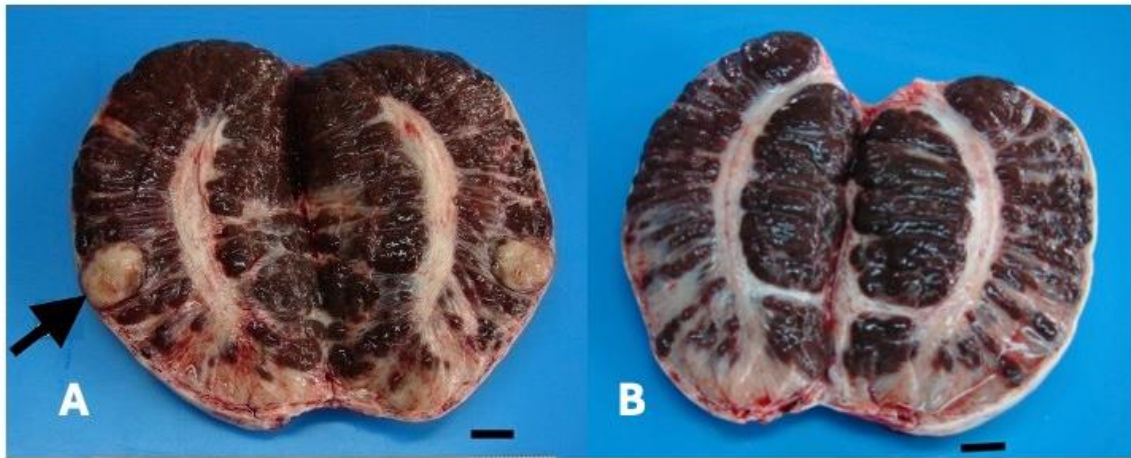


Figure 1 Comparison of the left and right testes from a boar with a Sertoli cell tumor. (A) The sagittal cut surfaces of the left testis containing the Sertoli cell tumor, revealing a well-circumscribed, round, white-tan nodular mass (approximately 1.5 cm in diameter; arrow). bar = 1 cm. (B) The sagittal cut surfaces of the right testis appear dark, with non-protruding testicular parenchyma, with multiple white streaks extending between the mediastinum testis and the inner layer of the tunica albuginea. Compressed white areas are also observed near the caudal poles. Bar = 1 cm.

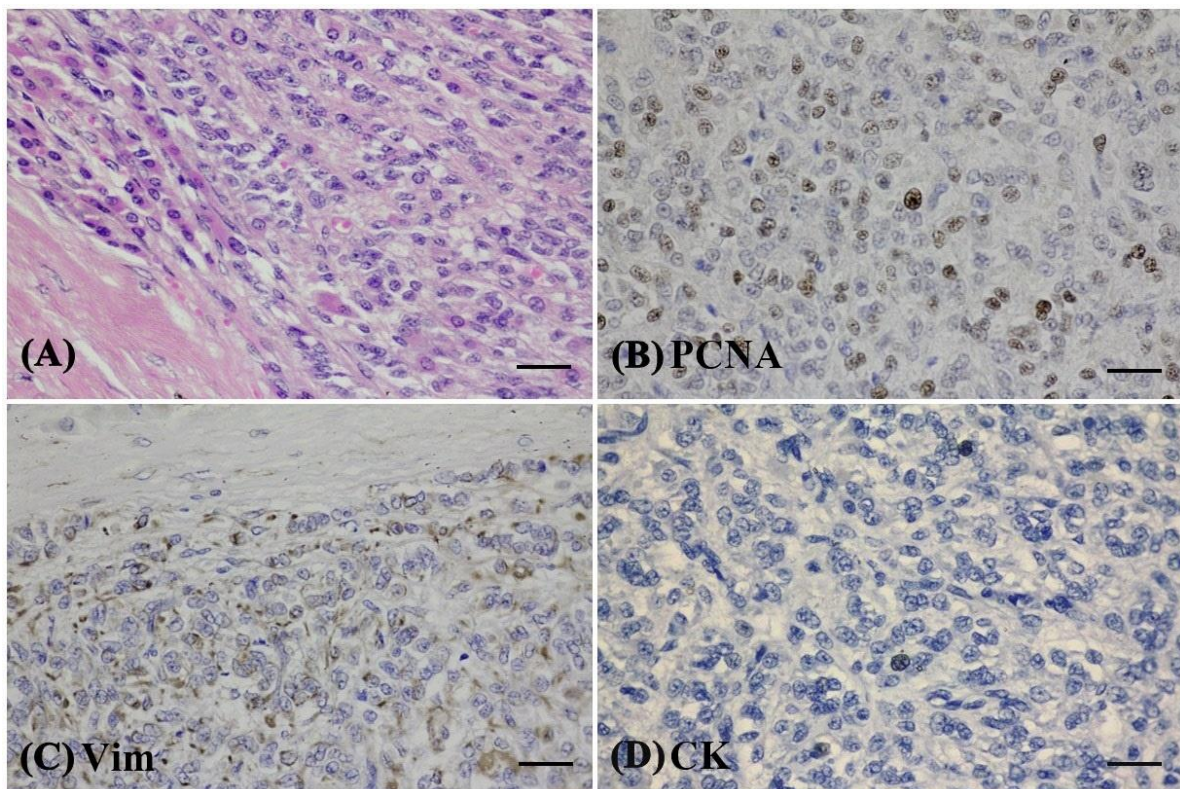


Figure 2 Histopathological and immunohistochemical features of a Sertoli cell tumor from a boar. (A) Densely packed, spindle-shaped tumor cells exhibiting round-to-ovoid basophilic nuclei and elongated eosinophilic cytoplasm. H&E, bar = 25 µm. (B) Strong immunolabeling for proliferating cell nuclear antigen (PCNA) in the nuclei of tumor cells. IHC, bar = 25 µm. (C) Moderate immunolabeling for vimentin (Vim) in the perinuclear region and cytoplasm of neoplastic Sertoli cells. IHC, bar = 25 µm. (D) Negative immunolabeling for cytokeratin (CK) in tumor cells. IHC, bar = 25 µm.

The histological features of the boar Sertoli cell tumor (SCT) were similar to those observed in canine SCTs, as both consisted of neoplastic Sertoli cells with comparable morphology and prominent fibrous stroma. Overall, the gross and histopathological changes in both testicular sides of SCT-affected boar indicated underlying reproductive dysfunction.

The immunohistochemical results are summarized in Table 1. Strong nuclear immunoreactivity for PCNA was observed in the boar SCT (Fig. 2B), whereas vimentin expression was moderate in the cytoplasm and perinuclear region of tumor cells (Fig. 2C). In canine SCTs, strong nuclear expression of PCNA and moderate cytoplasmic and perinuclear expression of vimentin were also observed in neoplastic cells (Fig. 4). In normal testicular tissue of both species, PCNA expression showed moderate nuclear labeling in the cells along the basement membrane of the seminiferous tubules (Figs. 3 and 5). Vimentin was strongly positive in the cytoplasm and perinuclear region of normal Sertoli cells but was negative in germ cells (Figs. 3 and 5). Cytokeratin immunoreactivity was absent in all tissues examined.

This study reports a case of SCT concurrent with severe bilateral testicular atrophy in a culled boar. Histologically, the tumor was consistent with a benign SCT, as it was well encapsulated, lacked invasion into adjacent tissues, and showed no mitotic figures. However, the previous report has described malignant SCTs with visceral metastasis in a 6-month-old boar and other species (Barrand and Scudamore, 2001; Pratt *et al.*, 2003).

Immunohistochemistry supported the Sertoli cell origin of the tumor and provided insight into its proliferative activity. Vimentin was expressed in both normal and neoplastic Sertoli cells, with stronger immunoreactivity observed in normal cells, suggesting possible downregulation during neoplastic transformation. This finding is consistent with previous reports (Sarli *et al.*, 1994; Zanghi *et al.*, 2004).

PCNA immunoreactivity was observed only in the cells along the basement membrane of the seminiferous tubules of normal testes but was more intense in neoplastic Sertoli cells of both boars and dogs, indicating increased proliferative activity. Similarly, PCNA expression has been reported in normal and neoplastic testicular tissues. (Liang *et al.*, 2001; D'Andrea *et al.*, 2008; Ausejo *et al.*, 2025). Cytokeratin immunoreactivity was absent in all

specimens, in agreement with previous studies in boars and dogs, although variable expression has been reported under certain pathological conditions. To the authors' knowledge, detailed immunohistochemical characterization of SCT in boars has rarely been documented.

These findings indicate that the SCT in this boar was consistent with a benign neoplasm based on its histopathological features. Severe concurrent testicular atrophy with fibrosis likely contributed to reduced reproductive performance and subsequent culling. Comparable immunohistochemical expression patterns of PCNA, vimentin, and cytokeratin were observed in SCTs and normal testes of both species.

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Table 1 Immunohistochemical expression of PCNA, vimentin, and cytokeratin in Sertoli cell tumors and normal testicular tissues of boars and dogs.

Species (n)	Testicular tissues	Immunohistochemical expression		
		PCNA	Vimentin	Cytokeratin
Boar (2)	Normal	++	+++	-
Boar (1)	Sertoli cell tumor	+++	++	-
Dog (5)	Normal	++	+++	-
Dog (3)	Sertoli cell tumor	+++	++	-

-, negative; +, weak; ++, moderate; +++, strong immunoreactivity.

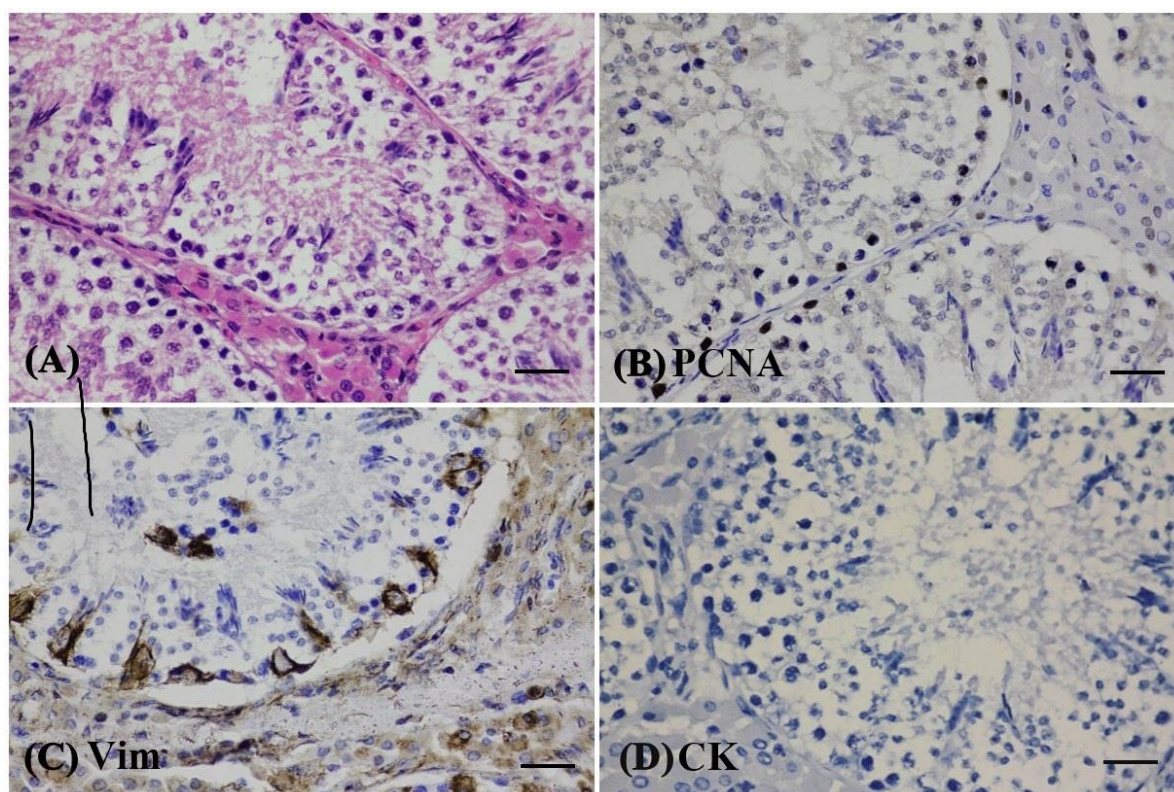


Figure 3 Histopathological and immunohistochemical features of the seminiferous tubules in a normal boar testis. (A) Normal seminiferous tubules. H&E, bar = 25 µm. (B) Moderate immunolabeling for proliferating cell nuclear antigen (PCNA) in the nuclei of spermatogonia. IHC, bar = 25 µm. (C) Strong cytoplasmic and perinuclear immunolabeling for vimentin (Vim) in Sertoli cells. IHC, bar = 25 µm. (D) Negative immunolabeling for cytokeratin (CK) in the seminiferous tubules. IHC, bar = 25 µm.

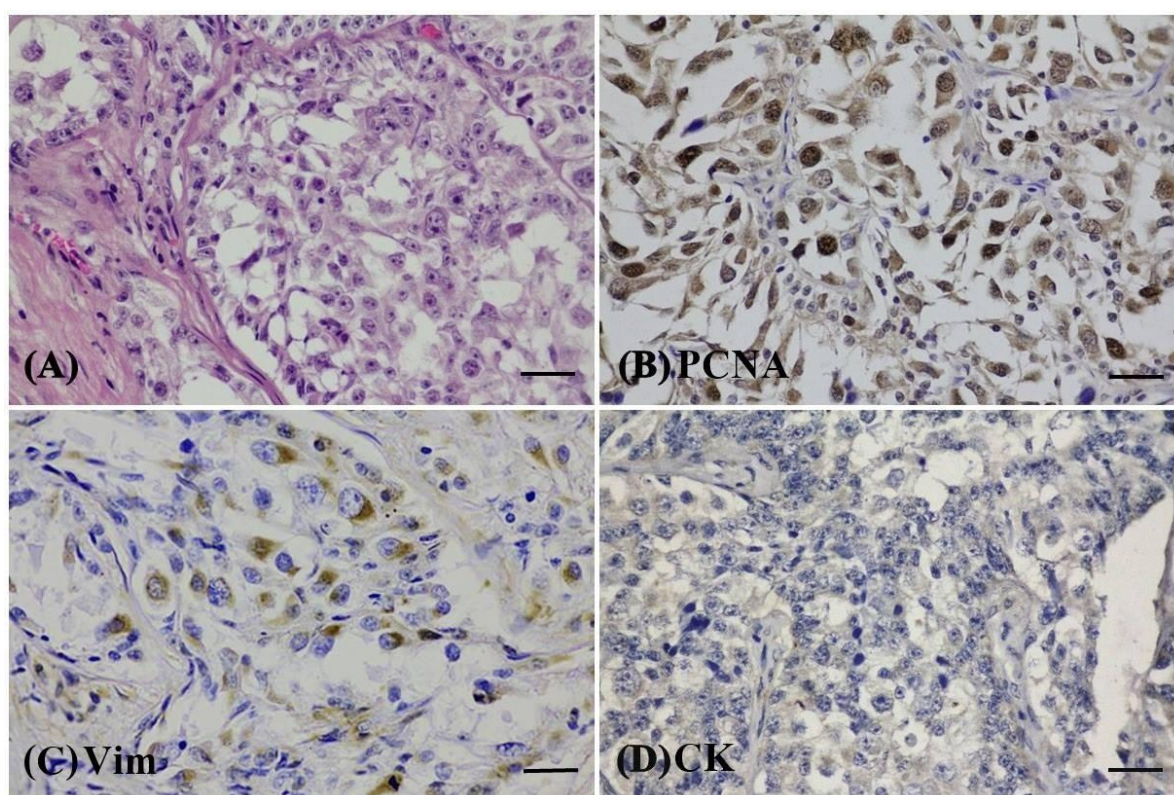


Figure 4 Histopathological and immunohistochemical features of a Sertoli cell tumor from a dog. (A) Pleomorphic spindle neoplastic cells with cytoplasmic vacuoles. H&E, bar = 25 µm. (B) Strong PCNA immunolabeling in the nuclei of tumor cells. IHC, bar = 25 µm. (C) Moderate immunolabelling of vimentin (Vim) in perinucleus and cytoplasm of neoplastic Sertoli cells. IHC, bar = 25 µm. (D) Negative labeling of cytokeratin (CK) in tumor cells. IHC, bar = 25 µm.

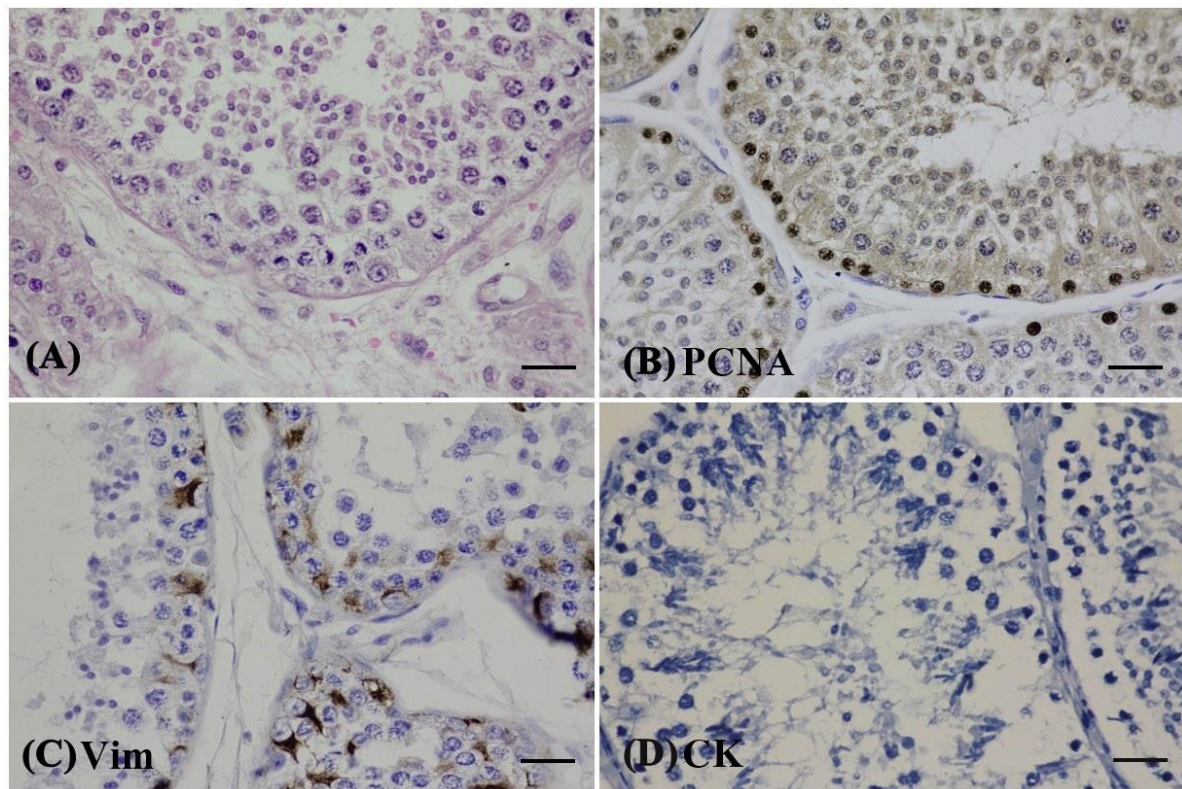


Figure 5 Histopathological and immunohistochemical features of the seminiferous tubules in a normal dog testis. (A) Normal seminiferous tubule. H&E, bar = 25 μ m. (B) Moderate nuclear immunolabeling for proliferating cell nuclear antigen (PCNA) in spermatogonia. IHC, bar = 25 μ m. (C) Strong cytoplasmic and perinuclear immunolabeling for vimentin (Vim) in Sertoli cells. IHC, bar = 25 μ m. (D) Negative immunolabeling for cytokeratin (CK) in the seminiferous tubules. IHC, bar = 25 μ m.

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