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**Case Report**

# Congenital renal hypoplasia and contralateral kidney failure in a giant otter (*Pteronura brasiliensis*) ex situ in Southeastern Brazil

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## Abstract

Renal hypoplasia is incomplete development of the kidneys, in which fewer than normal numbers of nephrons are present at birth. This report is the first of these conditions in mustelids. A female adult giant otter (*Pteronura brasiliensis*), ex situ, presented clinically an unusual behavior with prostration, anorexia, hiding in the shelter, ataxia, paraparesis, and death in a clinical course of one day. At the postmortem exam, the left kidney was markedly enlarged and pale and the right kidney was severely reduced and had mild to moderate capsular thickening. Histologically, the left kidney had mineralization, proliferation of fibrous connective tissue and a mild neutrophilic infiltrate. The right kidney presented a reduced number of glomeruli, tubular atrophy and an increase in fibrous connective tissue, which were findings compatible with congenital kidney hypoplasia. Due the clinical condition of the animal, gross and microscopic findings, the cause of death was established as kidney failure induced by renal hypoplasia.

**Key words:** Mustelidae, Lutrinae, renal atrophy, kidney failure, congenital anomalies.

## Introduction

Congenital renal hypoplasia presents as a rare disease of incomplete development of the kidneys. It is reported in some domestic species, such as pigs, dogs, cats, cattle and horses, in which the kidney of may be reduced in size unilaterally or bilaterally, with a smaller number of nephrons. When unilateral, contralateral hypertrophy is expected (5, 9).

The giant otter (*Pteronura brasiliensis*, Zimmermann, 1780) is the largest species in the Mustelidae family, with semi-aquatic living and nowadays is found restricted to the Amazon basin and the Brazilian Pantanal, owing to hunting, fragmentation and loss of habitat, construction of hydroelectric plants, mining, invasive agriculture, tourism and conflict with fisherfolk. The species is classified as threatened by the IUCN, in addition to being included in the appendix I of CITES and being listed as vulnerable in Brazil by the Chico Mendes Institute for Biodiversity Conservation (ICMBio) (11, 13). The priority actions for conservation of this species ex situ are evaluation of sanitary status, the establishment of a conservation program, identification of the genetic profile, and development of protocols for sample collection (11).

 

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In animals of the Lutrinae subfamily, most studies are restricted to the detection and description of several infectious diseases, such as distemper, herpesviral and parvovirus infection (7), besides leptospirosis and toxoplasmosis (12). Additionally, there are few reports of noninfectious diseases, such as traumatic lesions, perinatal death, poisonings, nutritional and metabolic diseases, and neoplasia (14). However, congenital anomalies are rare and reports have not been identified. Therefore, this study described the gross and microscopic aspects of congenital renal hypoplasia and acute kidney failure in a giant otter (*P. brasiliensis*) ex situ.

## Case description

A female adult giant otter (*P. brasiliensis*), weighing 16.2 kg, was rescued with one year of age in the city of Santana de Macapá (Amapá state, Brazil) and kept under human care for a four-year period at the Sorocaba Zoo (Parque Zoológico Municipal Quinzinho de Barros, São Paulo state, Brazil; 23°30'21" S, 47°26'17" W). The animal was clinically healthy and was kept in an enclosure shared with an adult male of the same species. It did not have any previous diseases in its medical history and was fed with whole fresh or frozen fish. Clinically, the otter presents an unusual behavior with prostration, anorexia, hiding in the shelter, ataxia, paraparesis, and death in a clinical course of one day. At the postmortem exam, it had a good body condition and severe enophthalmos (suggestive of dehydration). The left kidney was markedly enlarged and pale, measuring 9.5 x 4.5 x 3 cm and weighing 190 g. On the cut surface, there were few white transversal streaks at the cortical region. The right kidney was severely reduced, measuring 4.2 x 2 x 1 cm and weighing 10-g weight. It had 5.2% of the mass of the left kidney, in addition to reduced kidney lobulation, and mild to moderate capsular thickening (Fig. 1). The remaining organs did not show any other pathological changes. Multiple fragments of organs were collected, fixed in 10% neutral buffered formalin, processed routinely for histology, and stained with hematoxylin and eosin.

Microscopic evaluation of the left kidney revealed multifocal areas of tubular and glomerular mineralization, proliferation of fibrous connective tissue at the pelvis and thickening of the glomerular tuff, which were associated with multifocal mild neutrophilic inflammatory infiltrate. The microscopic findings were compatible with subacute neutrophilic interstitial nephritis associated with mineralization. The right kidney showed severe atrophy and a reduction in the number of glomeruli associated with multifocal expansion of the Bowman's space (compatible with renal hypoplasia) (Fig. 2). Some tubules were atrophic, and among them, there was a significant amount of interstitial fibrous connective tissue, besides rare areas of lymphocyte and plasma cell inflammatory infiltrate. Due the clinical condition of the animal, gross and microscopic findings, the cause of death was established as kidney failure induced by renal hypoplasia.

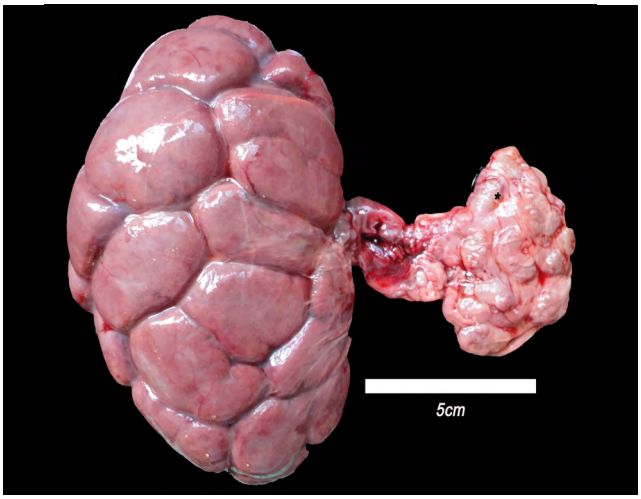


**Figure 1.** Gross features of congenital renal hypoplasia and contralateral kidney failure in a giant otter (Pteronura brasiliensis) ex situ. The right kidney is markedly reduced (*), with a reduction of lobulation, and moderate capsular thickening. The left kidney is severely enlarged and pale. Bar = 5 cm.

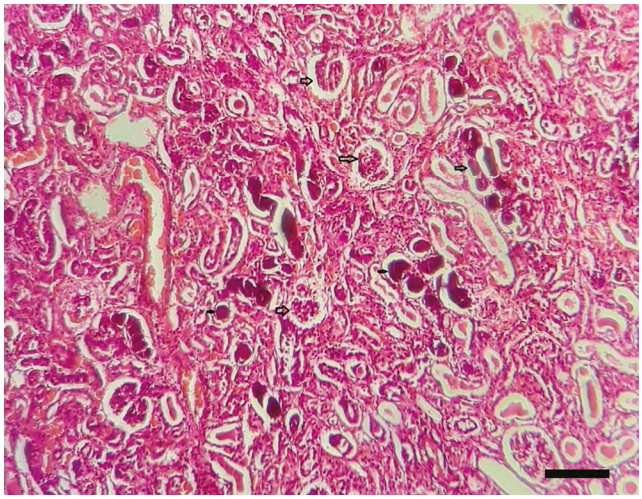

**Figure 2.** Microscopic characterization of congenital renal hypoplasia and contralateral kidney failure in a giant otter (*Pteronura brasiliensis*) ex situ in Sorocaba, São Paulo, Brazil. The right kidney showed severe atrophy and a reduction in the number of glomeruli (hollow arrow) associated with multifocal expansion of the Bowman's space compatible with renal hypoplasia and multifocal areas of tubular and glomerular mineralization (full arrow). HE, 20x. Bar = 1:10.

## Discussion

The main cause of kidney injury in Lutrinae specimens available in the scientific literature is reported to be associated with urolithiasis (14). This condition occurs either in wild or ex situ animals with a high prevalence (23.4% - 64.7%). However, it is occasionally unassociated with microscopic renal lesions and in mustelids, it should not be considered the cause of death (3). Furthermore, reports of kidney diseases in giant otters are scarce, with one case of bilateral nephrolithiasis associated with tubular necrosis (1), and one report of leptospirosis by *Leptospira interrogans* (10). Congenital diseases in mustelids are restricted to rare case reports of porencephaly in *Lontra longicaudis* (4), cardiomyopathy in *Mephites mephites* (2), polycystic kidney disease in *Mustela* sp. (6) and other tegument, reproductive, and ophthalmological conditions (14). However, to the author's knowledge, there are no previous investigations of congenital kidney diseases in the family Lutrinae.

Among the congenital and hereditary kidney anomalies, renal hypoplasia is the incomplete development of the kidneys, it is reported in some domestic and wild species, in which a fewer number of nephrons are presented at birth and may be a marked reduction in renal mass. The nephrons that do not show any microscopic morphological changes other than the reduction of glomerulus and tubules (5, 9). Such conditions result in reduced kidney function and progressive long-term kidney disease. Unilateral hypoplasia often leads to an overburden of the contralateral kidney, as in this case. Atrophy, aplasia, and renal dysplasia must be included in the differential diagnosis (9), which were obtained from the microscopic features of the hypoplastic kidney. Regarding wild species, congenital renal hypoplasia with compensatory hyperplasia was reported in an adult raccoon (*Procyon lotor*) that died from a traumatic event (8). This raccoon showed evidence of chronic inflammatory changes in the hypoplastic kidney, similar to this report. However, the contralateral kidney did not show microscopic changes, diverging from the giant otter in this report that had a neutrophilic multifocal interstitial nephritis, which was associated with kidney failure.

Therefore, it is possible to infer that the pathological finding of congenital renal hypoplasia is related to the cause of death of the giant otter, resulting in the contralateral kidney failure. This document aid in early diagnosis of congenital kidney disease as well as it represents the first report of this condition in mustelids.

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## Conflict of Interest

The authors declare no competing interests.

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