

Diagnosis of Polyuria and Polydipsia

Diagnosis



Examination



Diagnosis



Result

Check presence of polyuria and polydipsia (PUPD)

- Polydipsia Dogs : >90~100 mL/kg/day Cats : >50 mL/kg/day
- Polyuria Dogs and cats : >50 mL/kg/day

- Assess signalment, symptoms, physical examination
- Review medications associated with PUPD
- Assess diet, environment, and vaccination history



Urinalysis, CBC, Biochemistry profile, Electrolytes, T4 (cats)



Definitive Diagnosis

- Diabetes mellitus (DM)
- Renal glycosuria
- Kidney disease (Chronic Kidney Disease (CKD), Acute Kidney Injury (AKI))
- Hyperthyroidism
- Hypokalemia
- Hypercalcemia
- Erythrocytosis



No Diagnosis

Consider possible differentials

- Hyperadrenocorticism
- Hypoadrenocorticism
- Hyperaldosteronism
- Early kidney disease
- E. coli infection (e.g., Pyelonephritis)
- Pyometra
- Liver disease
- Portosystemic shunt
- Leptospirosis
- Intestinal leiomyosarcoma
- Splenic hemangiosarcoma
- Pheochromocytoma
- Central diabetes insipidus (CDI)
- Congenital nephrogenic diabetes insipidus (NDI)
- Psychogenic polydipsia (PP)



Pursue Additional Tests as needed *



No Diagnosis



- Modified water deprivation test
- Multiple assessments of urine specific gravity
- Measurement of plasma osmolality
- Desmopressin trial



Diagnostic Results *



Definitive Diagnosis

- Hyperadrenocorticism
- Hypoadrenocorticism
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Definitive Diagnosis

CDI



Definitive Diagnosis

Congenital NDI



Definitive Diagnosis

PP

Diagnosis of Polyuria and Polydipsia

Check presence of polyuria and polydipsia

- 1) Polydipsia: Dogs: $>90 \sim 100$ mL/kg/day Cats : >50 mL/kg/day
Ideally, water intake should be measured quantitatively, but semi-quantitative assessment (e.g., number of times the water bowl is refilled) is acceptable.
- 2) Polyuria: Dogs and cats : >50 mL/kg/day
Quantitative measurement of urine output is often difficult. Semi-quantitative assessment based on history (e.g., frequency and volume per urination) is commonly used.
It is important to differentiate from pollakiuria and urinary incontinence.

Important Factors to Check in Polyuria and Polydipsia Cases

- 1) Medications
Glucocorticoids, Phenobarbital, Diuretics, Mannitol
- 2) Diet
Excess or deficiency of protein and salt (e.g., urinary stone dissolution diets, homemade diets)
Highly digestible or hydrolyzed diets
- 3) Environment
High temperature environment
- 4) Vaccination
Leptospirosis

Signalment

- 1) Age
Young: Congenital diseases (e.g., Renal hypoplasia, Portosystemic shunt , Congenital NDI)
Psychogenic polydipsia
Medullary osmotic gradient may be undeveloped
Middle age to Senior: CKD, DM, Hyperadrenocorticism (dog), Hyperthyroidism (cat), Neoplasia
- 2) Sex
Intact female: Pyometra
Intact male: Prostatitis, Prostate abscess

Note: These findings assist in prioritizing differential diagnoses

Symptoms and Physical Findings

Symptoms and Physical Examination	Possible Differentials
Polyphagia, Panting, Abdominal distention, Symmetrical alopecia, Hepatomegaly, Muscle weakness	Hyperadrenocorticism
Weight loss, Polyphagia, Increased activity, Tachycardia, Vomiting, Palpable thyroid nodule, Heart murmur	Hyperthyroidism
Polyphagia, Weight loss, Cataracts (dog) Plantigrade stance (cat)	DM
Intact female, Purulent vulvar discharge Decreased appetite, Vomiting	Pyometra
Enlarged lymph nodes, Perianal nodules	Neoplastic Hypercalcemia
Weight loss, Muscle wasting, Decreased appetite, Renal atrophy	CKD

🔍 Urinalysis, CBC, Blood chemistry profile, Electrolytes, T4 (cats)

1) Urinalysis

Tests/ Test results	Possible Differentials
Urine specific gravity (USG)	See Fig 1.
Urine glucose	DM, Renal glycosuria, Fanconi syndrome
Proteinuria	CKD, Hyperadrenocorticism, Pyelonephritis, Pyometra, Prostatitis, Prostate abscess
Pyuria	Pyelonephritis, Pyometra, Prostatitis, Prostate abscess, DM, Hyperadrenocorticism

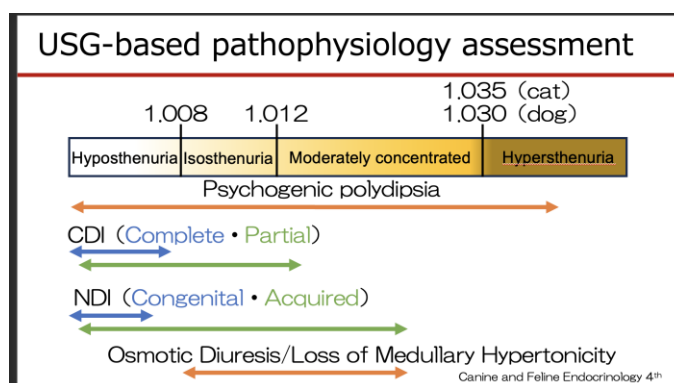


Fig.1 Possible differentials from USG results

2) CBC

Leukocyte Patterns	Possible Differentials
Inflammatory leukogram ↑ Neutrophils ↑ Band cells (left shift)	<ul style="list-style-type: none"> • E.coli infection (e.g., Pyometra, Pyelonephritis) • Leptospirosis, etc.
Stress leukogram ↑ Neutrophils ↑ Monocytes (dogs) ↓ Lymphocytes ↓ Eosinophils	<ul style="list-style-type: none"> • Hyperadrenocorticism • Physiological stress (e.g., various diseases) • Hyperthyroidism, etc.
Lack of stress leukogram (in the face of stress)	• Hypoadrenocorticism
↑ PVC	<ul style="list-style-type: none"> • Dehydration • Hyperthyroidism (mild increase) • Hyperadrenocorticism (mild increase) • Chronic hypoxia (e.g., cardiopulmonary disease) • Renal disease (neoplastic or non-neoplastic) • Extramedullary neoplasia • Polycythemia vera
↓ PVC	<ul style="list-style-type: none"> • Kidney disease • Liver disease/PSS • Hypoadrenocorticism etc

3) Blood chemistry, Electrolytes, T4 (cats)

Cause of PU/PD	Clinical Clues
DM	↑GLU ↑TG, ↑T-CHO, ↑ALT, ↑ALP
Hyperthyroidism	↑ALT, ↑ALP, ↑BUN, ↑CRE, ↑IP ↑T4
Hyperadrenocorticism	↑ALP (often markedly elevated), ↑ALT ↑T-CHO, ↑TG, ↑GLU, ↓BUN
Hypoadrenocorticism	↓Na, ↑K, ↓Na/K ratio ↑BUN, ↑CRE, ↑IP, ↑Ca, ↑ALT, ↑ALP ↓GLU, ↓T-CHO, ↓ALB
Hyperaldosteronism	↓K ↑CK, ↑BUN, ↑CRE, ↓IP
Kidney disease	↑BUN, ↑CRE, ↑SDMA ↑IP, ↓ or ↑K
Portosystemic shunt	↓BUN, ↓GLU, ↓ALB, ↓T-CHO, ↑ALP, ↑ALT, ↑NH3
Liver disease	↓BUN, ↓GLU, ↓ALB, ↓T-CHO, ↑ALP, ↑ALT, ↑NH3, ↑T-BIL
Leptospirosis	↑BUN, ↑CRE, ↑IP, ↓ or ↑K ↑T-BIL, ↑ALP, ↑ALT ↓ALB, ↑CK, ↑CRP
Hypokalemia	↓K ddx : Hyperaldosteronism, Kidney disease, GI loss, Diuretics, etc.
Hypercalcemia	↑Ca ddx : Neoplasia, Primary hyperparathyroidism, Kidney disease, Hypoadrenocorticism, Vitamin D toxicity, Osteolysis, Granulomatous disease, Idiopathic(cats)



Additional Tests as needed

Cause of PU/PD	Additional Tests to Consider
DM	<ul style="list-style-type: none">• Fructosamine
Hyperadrenocorticism	<ul style="list-style-type: none">• Low dose dexamethasone suppression test• ACTH stimulation test• Urine cortisol creatinine ratio• Abdominal Ultrasonography• Blood pressure
Hypoadrenocorticism	<ul style="list-style-type: none">• Baseline cortisol : If $> 2 \mu\text{g/dL}$ → Rule out If $< 2 \mu\text{g/dL}$ → ACTH stimulation test
Hyperaldosteronism	<ul style="list-style-type: none">• Aldosterone concentration• Abdominal ultrasonography• Blood pressure
Kidney disease	<ul style="list-style-type: none">• Abdominal Ultrasonography• Blood pressure• Urine protein creatinine ratio
E. Coli infection (e.g., Pyelonephritis)	<ul style="list-style-type: none">• Abdominal Ultrasonography• Urine culture
Pyometra	<ul style="list-style-type: none">• Abdominal ultrasonography
Liver disease Portosystemic shunt	<ul style="list-style-type: none">• Total bile acids (if not icteric)• Abdominal ultrasonography• Computed Tomography• Liver biopsy
Leptospirosis	<ul style="list-style-type: none">• Leptospira PCR• Leptospira Antibody test
Gastrointestinal Leiomyosarcoma	<ul style="list-style-type: none">• Abdominal Ultrasonography
Splenic Hemangiosarcoma	<ul style="list-style-type: none">• Abdominal Ultrasonography
Pheochromocytoma	<ul style="list-style-type: none">• Blood pressure• Abdominal Ultrasonography• Urine normetanephrine creatinine ratio

If there are no diagnoses still, consider the following additional tests as appropriate.



- Modified water deprivation test
- Multiple assessments of USG
- Measurement of plasma osmolality
- Desmopressin trial

Diagnostic Results

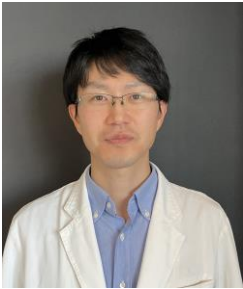
	Incidence	Age	Plasma Osmolality	USG	Response to Desmopressin	Other Features
PP※	Rare	Dogs: 4 yrs (6 mos–4 yrs)	↓~ Normal	1.001~ >1.025	No response	Stress-related
CDI	Rare	Dogs: 6 yrs (7 wks–14 yrs) Cats: 1 yrs (8 wks–6 yrs)	Normal ~↑	Complete: <1.006 Partial: <1.015	Positive response	Neurological signs, prefers water over food
NDI ※	Extremely rare	Dogs: 1–3 mo	Normal ~↑	1.001~ 1.008	No response	prefers water over food

※ No reported cases in cats

Dx **Diagnosis** (see front page)

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