

## Symmetry dimethylarginine (SDMA) assay for diagnosis of kidney disease in dogs and cats: a mini review of case reports in Indonesia

Fitriya N.A. Dewi<sup>1</sup>, Sus Derthi Widhyari<sup>1</sup>, Arief Purwo Mihardi<sup>1,2</sup>, Setyo Widodo<sup>1</sup>, Anita Esfandiari<sup>1,\*</sup>

<sup>1</sup> Division of Internal Medicine, IPB School of Veterinary Medicine and Biomedical Sciences, IPB University

<sup>2</sup> Joint Graduate School of Veterinary Medicine, Yamaguchi University, Japan

**ABSTRACT:** Symmetry Dimethylarginine (SDMA) is an important biomarker for early diagnosis of kidney disease. Studies suggest that SDMA is a more sensitive indicator of kidney function compared to traditional markers such as blood urea nitrogen (BUN) and creatinine. Since 2015, the International Renal Interest Society (IRIS) has established SDMA as one of the indicators for diagnosis and determining the stage of chronic kidney disease (CKD) in dogs and cats. SDMA assay use in veterinary clinics in Indonesia has empirically become more common. The aim of this study was to identify scientific re-ports on SDMA assay use in the diagnosis of kidney disease in dogs and cats in Indonesia. We performed a literature search in the Garuda portal and Google Scholar using the following keywords: “SDMA” or “Symmetry Dimethylarginine”, “dogs”, “cats” and “Indonesia”. The search strategy utilized English and Bahasa Indonesia, and the results were screened for relevance to the topic, and limited to studies conducted in Indonesia. Seven scientific articles in national and international journals reported the use of SDMA assay in cases of kidney disease in dogs or cats in Indonesia, published between 2021-2023. It is expected that SDMA assay use will continue to increase in veterinary practice settings in the country, and it is therefore critical to have a proper understanding of the advantages and limitations of SDMA use for kidney disease diagnosis.

### Keywords:

CKD, SDMA, renal, biomarker, pets

### ■ INTRODUCTION

Chronic kidney disease (CKD) in dogs and cats is progressive and marked by irreversible loss of kidney function (Santis *et al.* 2022). Its prevalence is 0.2% in dogs and 0.05-3.74% in cats, increasing with age (Brown *et al.* 2016, O’Neill *et al.* 2013). Early CKD detection is crucial, and biomarkers, such as podocin peptides, cystatin C, and symmetric dimethylarginine, have been studied for diagnosis (Pelander *et al.* 2019).

Symmetric dimethylarginine (SDMA) is a stable byproduct of methylated arginine proteins (Rysz *et al.* 2017) that inhibits nitric oxide synthase and circulates after proteolysis (Hokamp & Nabity 2016). It is a promising marker of the glomerular filtration rate (GFR) (Nabity *et al.* 2015). It has become more reliable as a renal function marker in human and animal studies (Kielstein *et al.* 2009). SDMA detects renal changes with 25% kidney function loss compared to 75% for creatinine (Lo *et al.* 2021). It is less influenced by extrarenal factors, aiding in the early detection of CKD (Smith *et al.* 2023). Included in the IRIS Guidelines for CKD diagnosis and staging in dogs and cats since 2015, its use in Indonesia has increased. This study assessed scientific reports on using SDMA to diagnose kidney disease in pets in Indonesia.

### ■ MATERIALS AND METHODS

A literature search was conducted in the Garuda portal and Google Scholar using the keywords “SDMA” or “Symmetric Dimethylarginine” and “dogs” and “cats” and “Indonesia” in both English and Indonesia. Rayyan (<https://rayyan.ai>) assisted in screening relevant articles. Only studies from Indonesia published in scientific journals were reviewed.

### ■ RESULT AND DISCUSSION

Literature screening identified five case reports and two experiments in Indonesia that evaluated or suggested using the SDMA assay for diagnosing kidney diseases in dogs and cats. These reports have been published in national or international scientific journals between 2021-2023 (Table 1).

Case studies show elevated SDMA levels and align with the IRIS guidelines for early CKD detection alongside creatinine and urinalysis. Longitudinal studies have indicated that SDMA has a superior ability to detect early renal function decline compared to creatinine (Nabity *et al.* 2015). Some

Received: 15-03-2024 | Revised: 12-04-2024 | Accepted: 17-04-2024



Copyright © 2024 CC-BY-SA. This is an Open Access article distributed under the terms of the Creative Commons Attribution ShareAlike 4.0 International License (<https://creativecommons.org/licenses/by-sa/4.0/>).

Table 1. Scientific reports with SDMA assay use in Indonesia for kidney disease diagnosis in dogs and cats between 2021-2023.

Pets	SDMA assay finding	Case Report / Research Topic	Reference
Dog	Elevated	Case Report (chronic kidney disease)	Pradnyani <i>et al.</i> 2021
Dog	Elevated	Case Report (chronic kidney disease)	Gunawan <i>et al.</i> 2023
Dog	Discussed, not evaluated	Case Report (chronic kidney disease)	Witoko <i>et al.</i> 2022
Dog	Elevated	Research: association of elevated SDMA and diseases of various systems	Sulistiwati <i>et al.</i> 2023
Dog	Elevated	Case Report (chronic kidney disease and infection)	Permatasari <i>et al.</i> 2023
Cat	Elevated	Case Report (lower urinary tract infection)	Pridayanti <i>et al.</i> 2023
Cat	Elevated, changed with treatment	Research: chemokine therapy for kidney disease	Bennington <i>et al.</i> 2021

studies have similar efficacy between creatinine and SDMA in detecting reduced GFR in dogs and cats. There is debate regarding the advantages of SDMA over urinalysis or creatinine concentrations in predicting CKD (Braff *et al.* 2014).

Symmetric dimethylarginine is recognized as a sensitive kidney function biomarker with both strengths and limitations. Our findings indicate the increasing use of the SDMA assay in Indonesian veterinary clinics, although further validation is required. Elevated SDMA levels can appear in dogs with nonspecific clinical signs such as gastrointestinal and cardiovascular disorders (Sulistiwati *et al.* 2023). Prerenal conditions and hydration status influence SDMA levels, while age, sex, and lean body mass generally do not (Hillaert *et al.* 2021). However, certain breeds (e.g., boxers and greyhounds) and diseases (e.g., thyroid disorders, neoplasia, and diabetes) can affect SDMA concentrations (Sargent *et al.* 2020).

## ■ FURTHER RESEARCH

As SDMA use is expected to increase in veterinary practice in Indonesia, understanding its advantages and limitations for kidney disease diagnosis is crucial. The consideration of other conditions that affect the values is also essential. Further research is needed to fully establish how to diagnose kidney diseases in the Indonesian veterinary context.

## ■ AUTHOR INFORMATION

### Corresponding Author

\*AE: anitaes@apps.ipb.ac.id

Division of Internal Medicine, School of Veterinary Medicine and Biomedical Sciences, IPB University, Jln. Agatis Kampus IPB Dramaga, Bogor, 16680, INDONESIA.

## ■ REFERENCES

Bennington J, Lankford S, Magalhaes RS, Shankle D, Fanning J, Kartini C, Suparto I, Kusumawardhani W, Putra MA, Mariya S, Badlani G. 2021. Chemokine therapy in cats with experimental renal fibrosis and in a kidney disease pilot study. *Frontiers in Veterinary Science*. 8:646087.

Braff J, Obare E, Elliott J, Yerramilli M. 2014. Relationship between serum symmetric dimethylarginine concentration and glomerular fil-

tration rate in cats. *Journal of Veterinary Internal Medicine*. 28(6):1699–1701.

Brown CA, Elliott J, Schmiedt CW, Brown SA. 2016. Chronic kidney disease in aged cats. *Veterinary Pathology*. 53(2):309–326.

Gunawan M, Amelia F, Resyana NN, R.C.F.Z, Zaenab S, Widyaputri T. 2023. IRIS-stage 4 CKD in a dog: diagnostic approaches and staging of chronic kidney disease: a case study. *Journal of Experimental Biology and Agricultural Sciences*. 11(1):216–125.

Hillaert A, Liu DJ, Daminet S, Broeckx BJ, Stock E, Paepé D, Hesta M, Vanderperren K. 2021. Serum symmetric dimethylarginine shows a relatively consistent long-term concentration in healthy dogs with a significant effect of increased body fat percentage. *Plos one*. 16(2):e0247049.

Hokamp JA, Nabity MB. 2016. Renal biomarkers in domestic species. *Veterinary Clinical Pathology*. 45(1):28–56.

Kielstein JT, Fliser D, Veldink H. 2009. Progress in uremic toxin research: asymmetric dimethylarginine and symmetric dimethylarginine: axis of evil or useful alliance? *Seminars in Dialysis*. 22(4):346–50.

Lo HC, Winter JC, Merle R, Gehlen H. 2021. Symmetric dimethylarginine and renal function analysis in horses with dehydration. *Equine Veterinary Journal*. 54(4):670–678.

Nabity MB, Lees GE, Boggess MM, Yerramilli M, Obare E, Yerramilli M, Rakitin A, Aguiar J, Relford R. 2015. Symmetric dimethylarginine assay validation, stability, and evaluation as a marker for the early detection of chronic kidney disease in dogs. *Journal of Veterinary Internal Medicine*. 29(4):1036-1044.

O'Neill DG, Elliott J, Church DB, McGreevy PD, Thomson PC, Brodbelt DC. 2013. Chronic kidney disease in dogs in UK veterinary practices: prevalence, risk factors, and survival. *Journal of veterinary internal medicine*. 27(4):814-821.

Pelander L, Haggström J, Larsson A, Syme H, Elliott J, Heiene R, Ljungvall I. 2019. Comparison of the diagnostic value of symmetric dimethylarginine, cystatin C, and creatinine for detection of decreased glomerular filtration rate in dogs. *Journal of veterinary internal medicine*. 33(2):630-639.

Permatasari SNI, Batan IW, Erawan IGMK. 2023. Laporan kasus: anaplasmosis dan ehrlichiosis pada anjing husky siberia penderita penyakit ginjal kronis. *Indonesia Medicus Veterinus*. 12(5):688–700.

Pradnyani GAPI, Widiastuti SK, Erawan IGMK. 2021. Laporan kasus: menangani penyakit ginjal kronis pada anjing peranakan pomeranian. *Indonesia Medicus Veterinus*. 10(3):517–531.

Pridayanti NKN, Anthara MS, Widyastuti SK. 2023. Infeksi saluran kemih bawah penyebab azotemia post-renal pada kucing persia campuran. *Buletin Veteriner Udayana*. 647.

Rysz J, Gluba-Brzózka A, Franczyk B, Jabłonowski Z, Ciałkowska-Rysz A. 2017. Novel biomarkers in the diagnosis of chronic kidney disease and the prediction of its outcome. *International Journal of Molecular Sciences*. 18(8):1702.

Santis FD, Boari A, Dondi F, Crisi PE. 2022. Drug-dosing adjustment in dogs and cats with chronic kidney disease. *Animals*. 12(3):262.

Sargent HJ, Elliott J, Jepson RE. 2021. The new age of renal biomarkers: does SDMA solve all of our problems? *Journal of Small Animal Practice*. 62(2):71–81.

Smith L, Bonde RK, Nau MR, Ball RL. 2023. Preliminary evaluation of symmetric dimethylarginine as a biomarker of renal insufficiency in wild and rehabilitated florida manatees (*Trichechus manatus latirostris*). *Journal of Zoo and Wildlife Medicine*. 54(2).

Sulistiwati E, Zulfitra Utami Putri, Cucu K. Sajuthi. 2023. Analisis serum symmetric dimethylarginine dalam berbagai gejala klinis pada anjing. *Acta VETERINARIA Indonesiana*. 11(3):244–9.

Witoko MC, Suartha IN, Widyastuti S. 2022. Case report: chronic kidney failure in local dog. *Journal of Veterinary and Animal Sciences*. 5(2):53–64.