

Research article

The Investigation of Adrenomedulline Levels in Dogs with Lower Respiratory System Diseases

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Abstract

In recent years, there have been many studies between humans and animals on Adrenomedullin (AdM) peptide, which is stated to have sometimes positive effects on internal organs such as the heart, lung, and kidney. The aim of this research was to analyze and compare AdM levels in dogs with lower respiratory tract disease and healthy ones. All dogs were furtherly grouped and evaluated pre and post-treatment. The findings showed that there was no difference between groups in AdM levels, however, a slight increase was observed in the post-treatment groups. Additionally, it was observed that some risk factors including age, breed, and living conditions might affect to AdM levels. In conclusion, further studies are needed to determine the effects of these risk factors on AdM in dogs with different respiratory tract diseases.

Keywords: Adenocarcinoma, Colorectal, Mucin

Introduction

Adrenomedullin (AdM) was isolated from human adrenal tumor cell (pheochromocytoma) in 1993 (Kitamura et al., 1993a; Voors et al., 2018). It is known as a peptide with vasodilation and natriuretic effects (Doğru, 2007a; Kanno et al., 2012). Human AdM consists of a six-membered ring structure, two sulfur bonds, and 52 amino acids (Kitamura et al., 1993a, b). This ring structure is similar to the ring structure found in calcitonin gene-related (calcitonin gene-related peptide, CGRP) and pancreatic amylin (Kitamura et al., 1993a, b). AdM present in many organ and also appears in human plasma. It serves as a loop hormone regulating systemic arterial pressure (Kitamura et al., 1993a, b; Santiago et al., 1995). It plays an important role in reactions such as phosphorylation and methylation in the

functionalization of proteins and important biological molecules (nucleic acids after protein synthesis) (Cıkcıkoğlu-Yıldırım, 2008). It has an important role in the regulation of the cardiovascular system in dogs (Kanno et al., 2012) and an effective vasodilator in the hind limb and pulmonary vascular portions of cats (Santiago et al., 1995). In addition, it is mentioned that AdM has compensatory effects in liver, lung, heart and kidney tissues of rats under stressful condition with increasing antioxidative enzymes and (Cıkcıkoğlu-Yıldırım, 2008).

Considering researches on human related to AdM, it has been observed that AdM has an important place in blood poisonings (Geven et al., 2018), and heart failures (Voors et al., 2018). In addition to these, there have been many studies on rats (Cıkcıkoğlu, 2003; Karakükcü, 2006; Doğru, 2007a, b; Eşrefoğlu et al., 2007; Doğru et

al., 2008; Yıldırım et al., 2009; Yıldırım and Yürekli, 2010a-b; Culum, 2013, 2018; Telli, 2017; Culum and Yürekli, 2019, 2020), cats (Santiago et al., 1995), dogs (Kanno et al., 2012) and cows (Sezer, 2021).

Investigation of all these positive or uncertain effects, the uncertainty of AdM levels in dogs with lower respiratory tract disease reveals the importance of the matter. The aim of this study was to determine whether AdM levels were affected in dogs with lower respiratory tract disease and it could be used as a diagnostic or prognostic biomarker in lower respiratory tract diseases in canines.

Material and Method

Sixteen sick dogs of different breeds, ages (1-15 years) and both gender, and 8 healthy control dogs were included in the study. They presented to Akademi Veterinary Clinic and Kırıkkale University Veterinary Faculty Animal Hospital with the complaints of respiratory diseases such as loss of appetite, weight loss, fever, dyspnea, cough. Blood samples were taken from the Vena cephalica antebrachii in the anterior leg of the animals into a red capped blood tube. Blood samples were centrifuged at 3000 rpm for 10 minutes at 4°C and serum stored frozen for up to AdM analysis at -20°C

AdM levels were evaluated with the commercially purchased ELISA assay kit (Cloud-Clone Corp., CEA220CA, China) on the Abaxis VetScan HM-5 device. Commercial test kit protocol was applied for the measurement, respectively.

After the clinical findings of the dogs whose physical examinations were performed, radiographs were taken from the dogs with suspected lower respiratory tract disease in the L/L and V/D positions.

Treatment protocols were created according to the severity of the disease and combined antibiotic using was preferred in severe sick dogs. Sick dogs were treated during 5 to 10 days.

Results

When the radiographic findings were examined, differences were observed before and after treatment (Fig. 1).

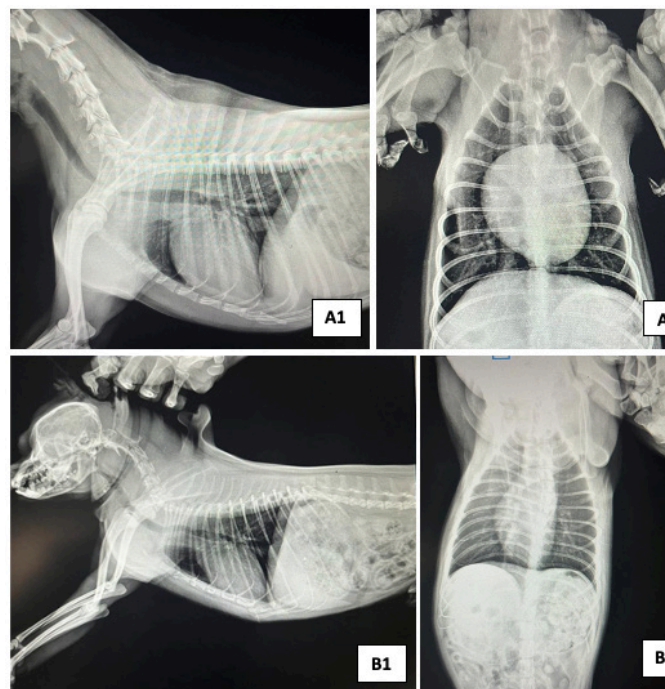


Fig. 1: Radiographic views of a pre-treatment canine (A1-A2) and a healthy canine (B1-B2), A1/B1- latero-lateral and A2/B2-ventro-dorsal radiographic images

Two absorbance readings were performed on 16 sick dogs, and the average of these absorbance values was obtained. For AdM result values

$$y = -1.3654x + 2.8652$$

calculations were made and the result values were used. AdM measurements were compared with the AdM staniagram associated with dogs. It was determined that the measurements were in accordance with the chart.

Comparison of Pre and Post-Treatment AdM Levels of Study Group

Pre-treatment AdM levels were ranging from 1.739 to 2.175 ng/L (mean 1.959 ng/L). These values show a slight difference at post-treatment (Table 1). The difference between the pre post-treatment AdM levels was statistically significant ($p < 0.05$).

Table 1. Comparison of AdM values of dogs in the study group before and after treatment

Group	n	AdM (mean)	min	max	Standart Deviation	Standart Error	p value
Pre-Treatment	16	1,96	1,74	2,18	0,13	0,03	$p < 0,05$ $R = 0,770$
Post-Treatment	16	2,21	1,85	2,78	0,24	0,06	

Comparison of Pre and Post-treatment AdM Levels of Study Group

When the minimum, maximum and mean values in the study group dogs were compared with the control group healthy dogs, AdM levels of healthy dogs with 1.8 to 2.29 ng/L (mean 2.08 ng/L) were slightly higher compared with sick ones (Table 2) and it was not statistically significant ($p>0.05$)

Table 2. Comparison of AdM levels of pre-treatment dogs in the study group and the control group dogs

Group	n	AdM (mean)	min	max	Standart Deviation	Standart Error	p value
Pre-Treatment	16	1,96	1,74	2,18	0,13	0,03	$p>0,05$
Post-Treatment	8	2,08	1,80	2,29	0,19	0,07	

Comparison of Post-Treatment AdM Levels

When the AdM data of the dogs in the study group after the treatment were compared with the healthy dogs, it was seen that the AdM levels were closer to each other (Table 3). However, it was determined that the difference between these levels was not statistically significant ($p>0.05$).

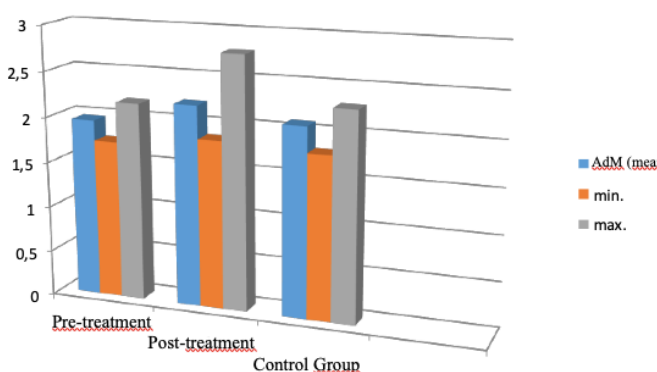
Table 3. Comparison of AdM levels of dogs in the study group after treatment and those in the control group

Group	n	AdM (mean)	min	max	Standart Deviation	Standart Error	p value
Pre-Treatment	16	2,21	1,85	2,78	0,24	0,06	$p>0,05$
Post-Treatment	8	2,08	1,80	2,29	0,19	0,07	

Bar Graphs of Groups

Bar graphs of pre and post-treatment AdM levels in dogs with lower respiratory disease and control groups were shown in Fig. 2.

Fig. 2. Bar diagram of the comparison of minimum, maximum and mean AdM values in study group and control group dogs.



Discussion

In this study, the post-treatment AdM levels of the dogs in the study group were found to be higher than before the treatment. Statistically, this increase in AdM levels of sick animals after treatment was found to be statistically significant ($p<0.05$). At the same time, a positive correlation was found between AdM levels in dogs before and after treatment ($R: 0.770$). However, no statistical difference was observed between healthy and sick dogs ($p>0.05$). The reason for this increase before and after treatment was thought to be the inability to remove Pro-AdM from the circulation in lung damage, the increase in AdM levels due to the inflammatory response, and the decrease in vasodilation and renal clearance. It was found to be compatible with the studies carried out in this context.

It is understood that AdM has a significant role in the internal organs of animals, were mostly carried out on rats divided into groups, and it generally had positive effects in different tissues (Cıkcıkoğlu-Yıldırım, 2008).. In this study, dogs with lower respiratory tract problems were studied for the firstly and it was observed that the mean results of AdM peptide slightly different between healthy and sick dogs in which AdM levels were very midly lower. The post-treatment AdM levels of dogs with lower respiratory disease were found to be close to the healthy dogs., Furtherly, there was a statistically significant difference was observed in pre-treatment AdM levels compared to post-treatment in sick dogs. Despite all this, it was thought that whether parameters such as canines' age, breed and living conditions (such as temperature, stress) would affect ADM levels with detailed studies. It was concluded that more studies are needed to fully elucidate this issue in the field of veterinary medicine.

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