

# The Relevance of Natriuretic Peptide in Medical Laboratory Diagnosis

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## ABSTRACT

Natriuretic peptides (NPs) are hormones that regulate blood pressure, cardiovascular homeostasis, and long bone growth. They are hormones which are mainly secreted from cardiac organ and have important natriuretic and kaliuretic characteristics. It is classified into four including; atrial NP, Brain-type NP (BNP), C-type NP and dendroaspis NP, a D-type NP, each with its own characteristic roles. The NP system involves three ligands and three receptors and result in situations such as diuresis, natriuresis, vasodilation, and inhibition of aldosterone synthesis and renin secretion as a circulating hormone. The N-terminal part of the prohormone of BNP is produced alongside BNP. This has indeed play a diagnostic value in cardiac attack. NPs or their fragments have been subjected to scientific observation for their diagnostic value.

**Key words:** Medical laboratory diagnosis, natriuresis, natriuretic peptide

## INTRODUCTION

Natriuretic peptides (NPs) are substance that induces natriuresis, which is the excretion of sodium by the kidneys. It is made by the cardiac organ. It is controlled in partly by enzymes such as neprilysin and corin, a transmembrane serine protease expressed by cardiomyocytes. The NP plays a central role in cardiac disorder.<sup>[1]</sup> The NPs are a group of peptide hormones that play important roles in the control of renal, cardiovascular, endocrine, and skeletal homeostasis. NPs is classified into four groups; atrial NP (ANP), brain-type NP (BNP), C-type NP and dendroaspis NP, a D-type NP, each with its own characteristic roles.<sup>[2]</sup>

The BNP and N-terminal proBNP (NT-proBNP) are found in the bloodstream normally, only in small levels. High levels can be regarded as the heart is not pumping as much blood as the body requires. NP tests measure the levels of BNP or NT-proBNP in the blood. The NP tests are both useful in diagnosing heart failure, but rely on different types of measurements.<sup>[3]</sup>

NP tests are most often used to diagnose or rule out heart failure. If it has already been diagnosed with heart failure, the test may be used to: Find out the severity of the condition, plan treatment and find out if treatment is working. The test may also be used to find out whether or not your symptoms are due to heart failure.<sup>[4]</sup>

Hence, a NP test may be needed when there are symptoms of heart failure such as: Difficulty breathing, coughing or wheezing, fatigue, swelling in abdomen, legs, and/or feet and loss of appetite or nausea.<sup>[5]</sup>

## PHYSIOLOGICAL ACTIONS OF NPs

NP is a group of distinctive hormones synthesized mainly by tissues of the cardiovascular system and they possess a unique 17 amino acid residue ring structure which largely gives bioactivity and specificity. Their synthesis in the cardiac is stimulated by cardiac chamber distension, angiotensin II, endothelin, and sympathetic nerve activity.<sup>[6]</sup> This synthesis

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occurs in cardiomyocytes from larger peptide precursors. When they are released by the cells, these NPs circulate to their target tissues where they attach to NPR-A receptors that are associated to guanylyl cyclase and the formation of cGMP. ANP is a 28 amino acid peptide. It is produced, stored, and released by atrial myocytes. Hence, elevated levels of ANP are found when blood volumes are elevated. BNP is a 32 amino acids peptide. It is first found in the brain. It is mainly synthesized by ventricular tissue in the heart. It has been established that there is increased synthesis and release of BNP during heart failure. Neutral endopeptidase (neprilysin) is a circulating enzyme that degrades NPs. The inhibition of this enzyme elevates circulating levels of NP and makes their effects active.<sup>[7]</sup>

## ROLE OF NP IN CARDIOVASCULAR AND RENAL EFFECTS

NPs play a crucial role in the long-term regulation of sodium and water balance, blood volume, and arterial pressure. It serves as a counter-regulatory system for the renin-angiotensin-aldosterone system. These peptide hormones reduced aldosterone release by the adrenal cortex.<sup>[8,9]</sup> It also elevates glomerular filtration rate and filtration fraction, They are responsible for natriuresis and diuresis as well as decrease renin release. Hence, resulting to decreasing circulating levels of angiotensin II. These actions may lead to a reduction in blood volume as well as central venous pressure, pulmonary capillary wedge pressure, cardiac output, and arterial blood pressure.<sup>[10]</sup> The constant elevations of ANP appear to decrease arterial blood pressure mainly by reducing systemic vascular resistance. The mechanism of systemic vasodilation involves ANP receptor-mediated elevations in vascular smooth muscle cGMP and by attenuating sympathetic vascular tone. This mechanism may cause ANP acting upon sites within the central nervous system and through inhibition of norepinephrine release by sympathetic nerve terminals.<sup>[11,12]</sup>

## THERAPEUTIC USE OF NP IN HEART FAILURE

Heart failure causes activation of the renin-angiotensin-aldosterone system, which leads to increased sodium and water retention by the kidneys. This in turn increases blood volume.<sup>[13,14]</sup> It contributes to the increased venous pressures associated with heart failure, which can result to pulmonary and systemic edema. The elevated angiotensin II also leads to systemic vasoconstriction, which increases the afterload on the left ventricle.<sup>[15]</sup>

The NP plays a central role in heart failure as it reduces pulmonary and/or systemic congestion and edema, this is associated clinical symptoms like shortness of breath known as dyspnea. NPs equally reduce the afterload on the heart by

promoting systemic vasodilation, which can lead to improved ventricular ejection.<sup>[16]</sup>

## NPs AND DIABETES

ANP and BNP have gained interest in diabetes. Evidence states that ANP can influence glucose and fat metabolism by increasing adiponectin concentration. This can protect against the onset of diabetes. The levels BNP and ANP can help further the understanding of the connection between diabetes and CVD.<sup>[17]</sup>

## CONCLUSION

It has been established that there are many physiological actions of NPs in the body. ANP and BNP have proven to be important for proper cardiovascular and kidney functions. Consequently, ANP and BNP statuses have proven to be helpful to cardiovascular, kidney, and diabetes. The various forms of NPs circulate throughout the body; however, research has shown that the NT pro-fragments of NPs are better for measuring concentrations.

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