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# The Effects of Angiotensin II and Analogues on Calcium Concentration in Catfish Hepatocytes

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## Introduction

### Angiotensin II

Angiotensin II is a hormone that plays a crucial role in regulating blood pressure and fluid balance in the body. It is produced in response to a decrease in blood pressure or blood volume and acts on the cardiovascular system to increase blood pressure and promote fluid retention. Angiotensin II is produced by the renin-angiotensin-aldosterone system (RAAS), which is activated in response to low blood pressure or volume. The system involves the conversion of angiotensinogen, a protein produced by the liver, into angiotensin I by the action of renin, an enzyme produced by the kidneys. Angiotensin I is then converted into angiotensin II by the action of angiotensin-converting enzyme (ACE), which is found primarily in the lungs.

Once produced, angiotensin II acts on the cardiovascular system in several ways. It causes constriction of the blood vessels, which increases blood pressure. It also promotes the retention of sodium and water in the kidneys, which increases blood volume and further increases blood pressure. Additionally, angiotensin II stimulates the production of aldosterone, a hormone that promotes sodium and water retention in the kidneys. In addition to its effects on blood pressure and fluid balance, angiotensin II has been implicated in several other physiological processes. It has been shown to play a role in the regulation of cell growth and differentiation, as well as the inflammatory response. It has also been shown to stimulate the release of other hormones, including vasopressin and prolactin.

## Description

The effects of angiotensin II are mediated by two main receptor subtypes, known as AT1 and AT2. AT1 receptors are found primarily in the cardiovascular system and are responsible for the vasoconstrictive and fluid-retaining effects of angiotensin II. AT2 receptors are found in a variety of tissues, including the kidneys and brain and their function is less well understood. Inhibition of the renin-angiotensin-aldosterone system is a common strategy for the treatment of hypertension and heart failure. Drugs that target this system include ACE inhibitors, which prevent the conversion of angiotensin I to angiotensin II and angiotensin receptor blockers (ARBs), which block the effects of angiotensin II at the AT1 receptor.

Angiotensin II is a hormone that plays a crucial role in regulating blood pressure and fluid balance in the body. Its effects are mediated by two main receptor subtypes and inhibition of its activity is a common strategy for the treatment of hypertension and heart failure. Further research is needed to fully understand the physiological functions of angiotensin II and its role in disease processes.

### Analogues on calcium concentration in catfish hepatocytes

Catfish (Ictalurus punctatus) is a common species of fish found in freshwater habitats in North America. The study of fish physiology can provide insights into the functioning of various cellular processes in vertebrates, including the effects of different hormones and peptides. One such hormone is angiotensin II, which is involved in regulating blood pressure and electrolyte balance in humans and other animals. In a study conducted on catfish hepatocytes, angiotensin II was found to induce an immediate increase in cytosolic calcium concentration. This effect was also observed with other analogues of angiotensin, including human angiotensin II, fish angiotensin II, human angiotensin III, human angiotensin I, fish angiotensin I and saralasin. However, another analogue, angiotensin IV, was found to be without effect.

The study also found that angiotensin II increased the resynthesis of phosphatidylinositol and the production of IP3, which are involved in cellular signaling pathways. Surprisingly, these physiological effects were not blocked by losartan (an AT1-selective antagonist) or PD 123177 (an AT2-selective antagonist), which are commonly used to block the effects of angiotensin II on its receptors. The findings of this study have important implications for our understanding of the cellular mechanisms of angiotensin II and its analogues. The observation that different analogues of angiotensin can induce similar effects on cytosolic calcium concentration suggests that these molecules may interact with common receptors or signaling pathways. The lack of inhibition by AT1- and AT2-selective antagonists suggests that the receptors involved in these effects may be different from the classical AT1 and AT2 receptors.

Further studies are needed to clarify the molecular mechanisms underlying the effects of angiotensin analogues on calcium signaling in catfish hepatocytes. However, these findings suggest that catfish can serve as a useful model system for studying the physiological effects of angiotensin and related molecules in non-mammalian vertebrates.

Angiotensin II is a peptide hormone that plays a crucial role in regulating blood pressure and fluid balance in the body. It acts on various organs, including the liver, where it can induce an increase in cytosolic calcium concentration. In catfish (Ictalurus punctatus) hepatocytes, angiotensin II has been found to trigger an immediate and significant rise in cytosolic calcium levels. This effect has also been observed with other angiotensin analogues, including human angiotensin II, fish angiotensin II, human angiotensin III, human angiotensin I, fish angiotensin I and saralasin. However, the analogue CGP 42112A only had a small effect at the highest concentration tested and angiotensin IV was found to be without effect [1-5].

## Conclusion

In addition to the increase in calcium concentration, angiotensin II also stimulated the resynthesis of phosphatidylinositol and the production of IP3 in catfish hepatocytes. These physiological effects were not blocked by losartan (AT1-selective antagonist) or PD 123177 (AT2-selective antagonist), suggesting that the effects of angiotensin II and its analogues on calcium concentration in catfish hepatocytes may be mediated by a different receptor subtype. The findings of this study provide important insights into

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the mechanisms by which angiotensin II and its analogues affect calcium concentration in the liver. Understanding these mechanisms may have clinical implications for the treatment of various conditions, such as hypertension and liver disease that are affected by the actions of angiotensin II. Further research is needed to explore the precise mechanisms involved in the response of catfish hepatocytes to angiotensin II and its analogues. Additionally, studies in other species and cell types may reveal further insights into the broader physiological and pathophysiological roles of angiotensin II and its analogues in the body.

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