

# TICK, TOCK... IS IT TIME TO PEE YET?



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**H**ave you ever wondered why you take more bathroom breaks during the day, but can sleep peacefully for hours during the night without needing to wake up and go?

According to consultant urologist Dr Goh Eng Hong, this is because our body has an internal clock (also called a circadian clock) that allows it to exert its influence on a variety of physiological processes, including our fluid intake, urine production, and urine storage.<sup>1</sup> This clock helps our body to adjust its many activities, including urine production, to the different ‘high’ and ‘low’ we experience throughout the day.

## HOW THE CLOCK TICKS

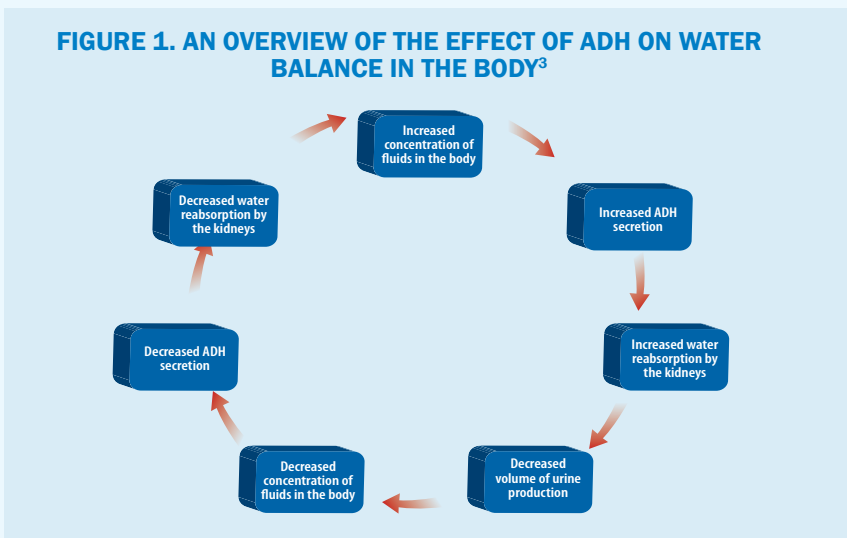
This clock is a series of complex interactions among certain genes, proteins (such as enzymes) and by-products of our metabolic processes. Unlike a mechanical clock, it doesn’t count seconds and minutes, but rather, it measures the rhythms caused by the distinct rise and fall of body temperature, plasma levels of certain hormones and other biological conditions.<sup>2</sup>

## LET’S TALK ABOUT THE URINE REGULATION PROCESS FIRST

Dr Goh explains that the body can detect changes in fluid concentration in several ways, which include detecting the changes in blood pressure (the higher the fluid intake, the higher the blood volume and hence pressure; and vice versa), changes in the concentration of certain

ions and molecules in the blood (higher water volume causes a decrease in the concentration of these substances, and vice versa) and so forth.

One primary hormone that plays a role in regulating fluid balance is the **anti-diuretic hormone (ADH) or vasopressin**. See Figure 1 for a simplified overview of its action on the body.



## URINE REGULATION & THE CIRCADIAN CLOCK

To date, we don’t have a full picture of the actual mechanisms behind the circadian rhythm, but research has uncovered enough evidence to suggest that there is a circadian pattern to urine production.<sup>1</sup> See Figure 2 for more detail on this rhythm.

**FIGURE 2. DAY VS NIGHT**

DAY	NIGHT
<p>We are alert during the day, so going to the toilet to pass urine isn’t really a hassle. Hence, the body adjusts by doing the following:</p> <ul style="list-style-type: none"> <li>• Lower ADH production<sup>1</sup></li> <li>• Higher urine production<sup>1</sup></li> <li>• Higher frequency of passing urine<sup>1</sup></li> </ul>	<p>Waking up from sleep to pass urine can be a hassle and it can also affect one’s quality of sleep. The body adjusts by doing the following:</p> <ul style="list-style-type: none"> <li>• Higher ADH production<sup>1</sup></li> <li>• Low urine production<sup>1</sup></li> <li>• Very low frequency of passing urine<sup>1</sup></li> </ul>

# WHEN THE INTERNAL CLOCK IS OFF

**T**here are instances in which the processes that comprise the circadian clock can go off track or break down. To get an idea of how such problems can affect us, let's take a look at one common consequence of the disruption to the circadian rhythm of ADH production: nocturnal polyuria.

## NOCTURNAL POLYURIA

Nocturnal polyuria is a condition that can arise when the circadian clock doesn't work normally, and ADH production is not sufficiently high at night to suppress urine overproduction.

Dr Goh says, "Among the elderly, it means more than approximately 30% of the daily urine production happens during the night. The percentage drops to 20% among the younger people."<sup>4</sup>

**The clock is off?** "Normally, a functioning circadian cycle will keep the amount of circulating ADH in check," explains Dr Goh. "Higher levels of ADH, along with other hormones and chemicals in the body, help to prevent excessive urine production at night."

Nocturnal polyuria can arise when the cycle is disrupted, as the inadequate levels of ADH at night can be one of the factors that contribute to the abovementioned overproduction of urine at night.

Dr Goh adds that people who already have pre-existing diseases such as heart failure, certain kidney disorders, sleep apnoea and neurological diseases such as Parkinson's disease may have an



increased risk of developing nocturnal polyuria.

**How do we know that we have this condition?** Having to wake up once or more to go to pee is a tell-tale sign that we may have nocturia, a possible symptom of nocturnal polyuria. However, there are many possible causes of nocturia, and we will only be certain after an official diagnosis has been made by a qualified healthcare professional.

"Diagnosing someone usually requires the patient to provide a detailed history to the doctor," says Dr Goh. "The patient will also be asked to fill up a bladder diary, and blood and urine tests may also be conducted."

**How is nocturnal polyuria treated?** According to Dr Goh, treatment is determined after the doctor has identified the causes. Medications that behave similarly to ADH may be

prescribed to reduce urine production at night. Dr Goh adds that patients will also benefit from lifestyle modifications, such as reducing water intake during evening hours and avoiding beverages which tend to result in increased urine production (such as coffee and alcohol).

If nocturnal polyuria is detected early and isn't severe in nature, Dr Goh points out that there is a good chance of the patient achieving permanent cure. Otherwise, there is a chance of it occurring again sometime in the future, especially when the underlying cause is not properly controlled and has become worse.

**Therefore, it is advisable to see a doctor if we find ourselves waking up several times at night to pee, or if doing so begins to affect our quality of life.**

Visit [www.waketopee.ie](http://www.waketopee.ie) for more information on nocturia polyuria.

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