

Josh’s Story – Part II

“You didn’t take water out to the site with you?” his father exclaimed, when Josh reported that he had drunk a few energy drinks and was puzzled why he got so dizzy. “You were seriously dehydrated. What did you learn about dehydration when you took biology in high school and college? You lose a ton of water sweating in heat like this, and the caffeine in those drinks doesn’t help. It’s a mild diuretic!”

“A diuretic? What is that? And how could I be seriously dehydrated?” Josh responded. “I drank both juice and the energy drinks, and I felt great at the time! Plus, I needed the energy boost.” Josh felt considerably better now that he had drunk water and cooled down a bit. But he was irritated that his father had questioned his thinking. After dinner, Josh went to the computer to do a little research about dehydration. Is that what happened, and were the energy drinks really to blame?

Josh learned that the definition of “diuretic” is “a substance that raised one’s amount of urination.” He found out that while caffeine is a mild diuretic, water and cranberry juice are mild diuretics, too. On the other hand, Josh confirmed that people can sweat excessively – up to 8 L per day! He realized he probably lost more liquid to sweat than he thought, and he learned that his dizziness was indeed a sign of dehydration. He learned that dehydration is defined as a loss of 3-8 percent of body mass in the form of fluids. Josh was surprised to find out that moving from a cool to a warm climate can make someone more susceptible to becoming dehydrated. He also learned that dehydration increased the risk of heatstroke, the third-greatest killer of high school athletes in the United States. 549

Body mass	Before working (a.m.)	After completing work (p.m.)
Josh’s body mass (kg)	77.25	73.55*

*This measurement of Josh’s mass was taken before he drank more water at the end of the scenario.

Figure 4.29 Change in Josh’s body mass.

Fluids	While working	During afternoon break	After completing work
In	0.95 L juice and water	0.95 L energy drink	0.78 L water
Out	Constant perspiration	0.91 L urine	none

Figure 4.30 Tracking fluids.

1. What percentage of body mass did Josh lose in the form of fluids? Do you think this represents serious dehydration? Explain your answer?

Percentage body mass lost in fluids = $[(\text{final mass} - \text{original mass}) / (\text{original mass})] \times 100$

One liter of water weighs 1 kg

2. How much fluid did Josh lose from sweating, versus from urination? Which factor was likely to be more important in causing his dehydration?

3. In what ways was Josh's body attempting to maintain an internal balance in spite of his external environment?

4. Imagine one of the cells that make up Josh's tongue (a taste bud). Draw sketches of what you think it might have looked like before Josh started to work and then another sketch of right before he stopped working for the day. Label key features of the cell.

5. Then rewrite the scenario of Josh's day from the perspective of this cell.

Imagine, what did the cell experience as the day grew warmer? After Josh drank the energy drinks? When he resumed working? After he stopped working and returned home? Give your cell a personality as you write – be creative!